PB-218 160

# PROJECTS IN INDUSTRIAL POLLUTION CONTROL PROGRAM, JULY 1972

George Rey, et al

Environmental Protection Agency
Washington, D. C.

December 1972

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W73-07064

EPA-R2-72-120
DECEMBER 1972

Environmental Protection Technology Series

PB 218 160

# Projects in the Industrial Pollution Control Branch July 1972

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PROJECTS IN INDUSTRIAL POLLUTION CONTROL PROGRAM,
JULY 1972,

G. Rey and G. Keeler

Environmental Protection Agency, Office of
Research and Monitoring

Environmental Protection Technology Series, Report EPA-R2-72-120,
December 1972. 385 p, 6 fig, 11 tab

EP1.23/2:72-120

a compilation of the information sheets of the 246 projects initiated since fiscal year 1967 through fiscal year 1972. Each sheet contains the objectives, statistical information, and a brief description of an initiated project.

General introductory information on the Federal Industrial Pollution Control Program is also presented to provide perspective on the magnitude of industrial pollution and the research directions that must be pursued in order to develop the technology to adequately control this largest point source of pollution in the United States.

During the fiscal year 1972 approximately $5.3 million of federal funds were committed in grants and contracts for projects having total estimated eligible costs of approximately $23 million. The approximately $17.7 million (77 percent of total commitments) of matching non-federal funds continues to emphasize the urgent reed, interest, and desire of American industry to undertake research in cooperation with the federal government to resolve the nation's industrial pollution problems.

(See also W70-04045 and W70-02285)

*Industrial water, *Water pollution control, *Water pollution treatment, Water reuse, Waste water treatment, Industries, Water quality

*Industrial pollution control, *Demonstration projects

05G, 09D, 03E

PB-218 160
MF ($0.95)

Cost of
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20402

Price $4.50

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EPA-R2-72-120
December 1972

# PROJECTS
# IN THE
# INDUSTRIAL POLLUTION CONTROL PROGRAM

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July 1972

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# ABSTRACT

Projects of the Industrial Pollution Control Program - July 1972 is a compilation of the information sheets of the 246 projects initiated since fiscal year 1967 through fiscal year 1972. Each sheet contains the objectives, statistical information, and a brief description of an initiated project.

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# INTRODUCTION

On formation of the National Industrial Pollution Control Council, President Nixon said, "It would be unrealistic, of course, to think that private enterprise could meet this problem alone The problem of the environment is one area where private enterprise can do the job only if government plays its proper role."

In 1966 the Congress of the United States enacted the Clean Water Restoration Act which provided, as stated in Section 6 (b) of this Act, for research, development and demonstration (R&D) to be conducted in the area of industrial pollution. The purpose of Section 6 (b) is "to develop new or improved methods of treating industrial wastes or otherwise preventing pollution of waters by industry, which method shall have industry-wide application." In addition this section allows federal grants to be made for up to 70 per cent of the eligible cost of a project with the stipulation that no grant may exceed $1,000,000. However, no grant may be made for any project unless it is determined that the project will serve a useful purpose in the development of a new or improved method of treating industrial wastes. The Clean Water Restoration Act is the authorization which has established the Industrial Pollution Control Program in the Office of Research and Monitoring of the Environmental Protection Agency (EPA).

In-house research and development, contracts, and grants are utilized to fully develop and demonstrate the applicability, effectiveness, reliability and economics of control and/or treatment techniques, devices and systems to be utilized for abating pollution from industry. The program is designed to meet immediate as well as long-range needs. The needs are for application and evaluation of pollution control techniques, devices, water reuse systems, and systems for ultimate disposal of industrial and joint municipal-industrial wastes.

This program will provide a wide spectrum of technical capability for research, development and demonstration. It includes economic evaluation of control and treatment methods and ancillary devices in order to provide the solutions for developing and applying advanced science and technology to problems related to industrial pollution control.

The general goal of the R&D program in industrial waste treatment, both by industry and by industry cooperating with government, is to obtain proven methods of control and treatment for all wastes from industry at reasonable costs. Many of the wastes from industry may be handled by some present state-of-the-art technology. However, this technology is limited in the number of proven techniques available and the effectiveness to meet high water quality standards. Moreover, much of what is considered as conventional technology has yet to be truly developed for application for the extensive variety of industrial wastes.

The ultimate goal of the EPA is to research and develop alternative economical treatment techniques and advanced waste treatment systems directed toward closed-loop systems.

Presently there are 246 projects, in progress or completed, which are or were sponsored under the Industrial Pollution Control Branch program. More than 300 "needs" have been logged into the Research Program Planning System. These "needs" will require a great deal of refinement and work effort to optimize and assemble them into a priority list cognizant with the EPA program objectives and mission. Some of these needs may lack sufficient priority of importance to merit funding by EPA. At the same time many more needs have yet to be identified.

EPA intends to research and develop the necessary treatment techniques for significant industrial wastewaters to the extent necessary to meet any water quality criteria and preferably to permit total water reuse. The pollution control methods to be developed are to have minimum impact on the environment.

As mentioned above, many industrial wastes may be controlled with existing technology. It is the responsibility of industry to implement this technology with its resources. In instances where new technology may provide methods for attaining higher water quality or lower costs, or both, relative to existing techniques, the industrial R&D program may assist industry to develop the technology, provided the technology has industry-wide applicability.

New developments involve risks normally not associated with the profit orientation of the particular industry. In a number of concepts even the obvious will not be undertaken unless incentives are provided. EPA may provide assistance in evaluating applications and suggestions and, at times, provide additional technical input to projects as well as cooperative grant dollars. It should be recognized that a good many of our grants are well below the 70 per cent statutory authorization for federal participation. The industry grantee in turn is obliged to provide proper evaluation resources and information to the public as well as acquiescing to a variety of other public regulations which require time and resources.

In the joint committee conference on this portion of the Act, it was stated by Congressman Cramer . . . "that industries should be brought into the research program and that these efforts should contribute toward control of water pollution in as effective a way as possible . . ." The program of the Industrial Pollution Control Branch is achieving this.

# INDUSTRIAL WATER REUSE

The program goal of industrial water reuse and product (or by-product) recovery is economically and technically sound.

Wastes must be considered as part of the manufacturing process and the cost of treating them must be included in the pricing of the product. Waste disposal operations normally result in a net cost to the industry producing the waste. However, by-product recovery and utilization techniques can reduce the net cost of treatment and frequently prove to be less expensive than other methods of disposal. In some cases a profit can be expected by the implementation of waste resources recovery as a pollution control method.

Recycled water may be the most valuable resource due to supply shortages, increasing water supply and water treatment costs, and mounting municipal sewerage charges. The recovery of product fines, useable water, and thermal energy are key methods of reducing overall waste treatment costs and should always be considered. Recovery of by-products from wastewater residues is in the scope of the present program. There are many products being recovered but there are a great many more that are not.

Frequently waste streams can be eliminated or significantly reduced by process modifications or improvements. One notable example of this is the application of save-rinse and spray-rinse tanks in plating lines. This measure brings about a substantial reduction in waste volume as well as a net reduction in metal dragout.

One of industry's principal requirements of wastewater treatment, by-product recovery, and water reuse is that the main product or products of the plant be satisfactory to the consumer and that the operation of the plants be efficient and economical.

Through cooperation with the EPA program, industries in general are becoming more aware of the need for overall pollution control and product (or by-product) recovery. This awareness has risen not only because pollution effects the environment, but also because pollution effects the general public, who are the customers. In addition, industries also depend upon our nation's rivers and streams for suitable water for their manufacturing processes.

In planning for the future industry must recognize that closed-loop industrial wastewater and water systems are vitally necessary to maintain continuity in future industrial expansion. The huge water demands and high growth rate of water usage of American industry cannot continue to rely solely on traditional water supply sources. Even in water-abundant areas, intake water supplies for industrial use are fast becoming restrictive. The trend toward water reuse has already been started. It must be accelerated now if we are to provide an adequate base for future industrial expansion.

Current and future environmental standards concerning discharges of wastewaters are expected to accelerate the pressure on industry to reduce both the pollutional discharge loads and the magnitude of effluent volumes in order to minimize impacts on the environment.

Industrial water quality requirements for reuse are less demanding, as a general rule, than for municipal supplies. Accordingly, direct industrial water reuse should be technically and economically achievable earlier than comparable municipal water reuse systems.

Wastewater reuse is therefore not only a resource conservation measure but also a method of pollution control. It is a step in tune with future demands. Adequate R&D activity in this area is the key to accelerating the implementation of extensive wastewater reuse systems and eventually the totally closed-loop cycle. The latter, which will result in no effluent discharge, would comply with any water quality standards, now, or in the future.

# INDUSTRIAL POLLUTION CONTROL TECHNOLOGY

## Introduction

Industries use huge quantities of the nation's waters and are the major factor in the continuing rise in water pollution. They utilize over 15 trillion gallons of water but, prior to discharge, treat less than 5 trillion gallons. Figure 1 presents the various uses of water in the United States for various periods of past years. The trends are obvious. In terms of a single pollution parameter, biochemical oxygen demand (BOD), the wastes generated by industries are equivalent to a total population of over 360 million people. Even more undesirable than the BOD loads of industrial effluents are the enormous quantities of mineral and chemical wastes from factories which steadily become more complex and varied. These mineral and chemical wastes include: metals such as iron, chromium, mercury, and copper; salts such as compounds of sodium, calcium, and magnesium; acids such as sulfuric and hydrochloric; petroleum wastes and brines; phenols; cyanides; ammonia; toluene; blast furnace wastes; greases; all varieties of suspended and dissolved solids; and numerous other waste compounds. These wastes degrade the quality of receiving waters by causing tastes, odors and color, excess mineralization, salinity, hardness, and corrosion. Some are toxic to plant, animal, and human life.

The variety and complexity of inorganic and organic components contained in industrial effluents present a serious liquid wastewater treatment control problem in that the pollution and toxicity effects of these constituents are of greater significance than those found in domestic wastewaters.

Conventional wastewater treatment technology is often adequate for domestic wastes but offers less promise of providing the type and degree of treatment to be required for industrial wastes. Industrial pollution control technology, therefore, must be developed and demonstrated to achieve effective and economical control of pollution from such industries as metal and metal products, chemical and allied products, paper and allied products, petroleum and coal products, food and kindred products, textiles, and leather goods.

To continue the attack on the problem of industrial pollution will require a cooperative industry-government effort to conceive, research, develop, and demonstrate treatment processes, production modifications, water reuse principles, and water conservation programs. The EPA research program has made Section 6 grants to manufacturers and processors representing major sources of industrial pollution.

Continued, expanded, and accelerated support is urgently needed to specifically implement the demonstration R&D programs related to new or improved technology for the treatment, reuse, and/or disposal of industrial wastewaters and their sludge residues. With large capital and operating expenditures facing American industry in the very near future, it becomes imperative that adequate pollution control technology be developed in a timely manner. Otherwise, industry will be faced with the implementation of older, less desireable, and questionable technological systems.

Existing data also suggests that about one-third of the total volume of wastes processed by municipalities is of industrial origin. Accordingly, emphasis must be continued to achieve effective water pollution control by means of joint municipal-industrial treatment.

Another promising and beneficial area requiring additional support is the implementation of closed-loop (water reuse) treatment systems for the industry to the extent that "zero" water effluent can be achieved.

An accelerated industrial pollution control research, development, and demonstration program will measurably decrease the amount of expenditures needed to implement water quality standards and to meet the industrial effluent requirements of the future.

## Objectives

The objective of the EPA's industrial wastewater treatment research program is to research, develop, and demonstrate the required technology to achieve required degrees of pollution control by least cost methods for all significant industrial sources of pollution.

## Program of Work

The program includes all R&D efforts necessary to resolve industrial pollution problems.

The objectives will be met by using the research and development grant mechanism, supplemented by in-house laboratory programs. The Industrial Pollution Control Programs implement and administer demonstration projects for new and improved industrial wastewater treatment projects applicable to the majority of all significant industries. These demonstrations include the latest developments in physical, chemical, and biological treatment methods and combinations thereof. It is expected to further achieve the cooperation of industry to participate in meaningful pollution abatement demonstrations and to increasingly demonstrate the feasibility of in-plant measures, by-product recovery, and wastewater reuse as feasible methods to abate pollution and to reduce treatment costs.

Research programs, consisting of in-house efforts and contracts to industries and universities, will be undertaken to complete state-of-the-art studies related to treatment and control technology for selected industry groups. Similarly, industrial wastewaters are to be identified, characterized, quantified, and classified for all industries of pollutional significance.

## Need

Industrial wastes are the nation's principal point sources of controllable waterborn wastes. In terms of the generally quoted measurements of strength and volume, the gross wastes of manufacturing establishments are about three times as great as those of the nation's sewered population as indicated in Table I. Moreover, the volume of industrial production which gives rise to industrial wastes is increasing at about 4.5 per cent a year or three times faster than the population. Also significant is the variance of composition of industrial wastes, which contain all known pollutants of concern in water pollution abatement as well as some unidentified factors.

Table I shows reported quantities of industrial wastewaters discharged in 1964 and **EPA** estimates of the quantities of standard biochemical oxygen demand ($BOD_5$) and settleable and suspended solids contained in the wastewaters. The wasteload estimates, based upon an estimate of the "average" quantity of pollutant per product unit, indicate that the chemical, paper, and food and kindred industrial groups generate about 90 per cent of the $BOD_5$ in industrial wastewater before treatment.

Similar statistics on net wasteload discharges are not completely available. However, indications are that the extent of industrial wastewater treatment is not greater than that currently practiced for municipal wastewaters.

Industrial wastes differ markedly in chemical composition, physical characteristics, strength, and toxicity from wastes found in normal domestic sewage. Every conceivable toxicant and pollutant of organic and inorganic nature can be found in industrial wastewaters, as indicated for selected industries in Table II. Thus, the $BOD_5$ and solids content often are not adequate indicators of the quality of industrial effluents. For example, industrial wastes frequently contain persistent organics which resist the secondary treatment procedures applied normally to domestic sewage. In addition, some industrial effluents require that specific organic compounds be stabilized or that trace elements be removed as part of the treatment process.

It is therefore necessary to characterize each industrial wastewater to more appropriately permit comparative pollutional assessments to be made for individual industries as well as industry groups. Characterization will also permit classifying the components of industrial wastewaters into as few as four basic classes of pollutants to more readily collate pollution statistics and to evaluate economics of methods of treatment as well as to project lease cost methods. Proposed generalized basic classification parameters are biochemical oxygen demand (BOD), total oxygen demand (TOD), suspended solids (SS), and total dissolved solids (TDS) into which all known pollutants can be classed.

In addition to the characterization of industrial wastewaters, the establishment of a relative pollution comparative index for all significant pollutants is also required. This index, in combination with the known characteristics and volume of a wastewater, will determine the relative gross pollution severity of all industrial wastes and establish a basis for comparing the severity of pollution from industries and other sources.

Table III presents both permissible criteria and desirable criteria for surface water for public supplies as obtained from the Report of the Committee on Water Quality Criteria, April 1, 1968. The addition of an assumed $BOD_5$ value of 5 mg/l to these criteria permits comparisons of the listed pollutants to be made against a unit of BOD. Under these circumstances it is relatively apparent that pollutants such as endrin and phenols (on a mg/l concentration equivalent basis) are 5000 times more critical as pollutants than BOD. Further work in this area will permit establishment of more accurate priorities in terms of our nation's most critical needs.

Industrial wastes will require research, development, and evaluation of treatment methods suitable for each significant industrial waste type that is significantly different from domestic wastes.

Table IV is a listing of all major industry groups and industries of suspected significant contributions to water pollution. These have been selected on the basis of a process water intake of at least 1 billion gallons per year and with regard to the potential for pollution from the process use of the water. For program planning and budgeting purposes, the industries are grouped into 13 subprogram elements, as shown in the second column of Table V. Within each element the identity of industry group(s) by the respective Standard Industrial Classification code number(s) is also presented, as in the second column of Table IV.

The industries listed in Table IV number approximately 150 and represent potentially equally numerous wastewaters of significantly different characteristics for which treatment technology must either be developed or upgraded. The interchangeability of treatment technology between similar types of wastewaters is anticipated but will have to be demonstrated through results of grant research projects or in-house studies. Because resource allocations may not be sufficient to encompass the potential R&D demand imposed by the diverse nature of industrial wastes, a priority system must be established and used in the allocation of R&D efforts for industrial wastewater problems.

At this time a firm priority for R&D activities, based on an ultimate comparable basis of pollution severity, has not been established for industrial wastes. However, from the data presented in Table I and with the assumption that the $BOD_5$ parameter of pollution severity is the prime indicator of pollution, an initial basis for ranking the industry groups for priority R&D efforts is possible. Nevertheless, knowledge of all chemical and physical parameters of pollution, as well as the state-of-the-art and economic considerations, is necessary to more adequately assess priority for R&D investments.

Table VI lists current program priorities for industrial pollution sources. These priorities were established on the basis of the best available information, the limited pollution parameter statistics available, the state-of-the-art, and the program investments to date.

In spite of the complexity and magnitude of industrial pollution, initial estimates of the costs of clean waters from industrial sources have been made. As summarized in Table VII, previous estimates of industrial capital requirements to abate pollution in a five-year period, to the extent of providing 85 per cent treatment effectiveness, are substantially less than estimated capital requirements for municipal treatment or collection facilities for separating combined sewers, while the gross pollutional load contributed is substantially greater than either. This indicates that either the average cost of industrial waste treatment, when based on treatment cost per lb BOD, is substantially less than for municipal waste treatment or the costs were underestimated. If these estimates are reasonably accurate, it would appear that, for the most part, industrial pollution control to the equivalency of secondary treatment is within a reasonable cost and need only be developed and demonstrated for the various industries in our economy which are significant contributors of pollution. However 85 per cent removal effectiveness is more likely to be insufficient to meet future standards and requirements.

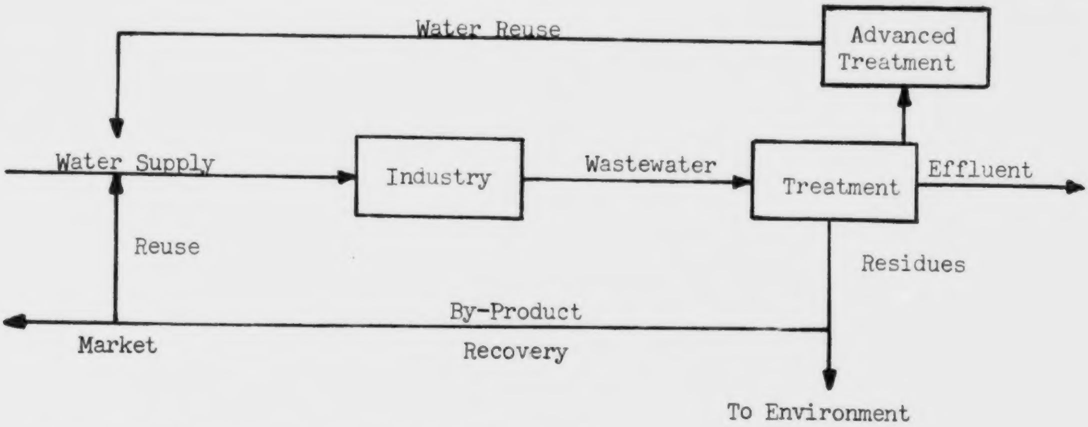
Table VIII, also based on 85 percent removal effectiveness, shows the estimated backlog of the value of waste treatment requirements of major industrial establishments for the fiscal years 1969 and 1973. Again, these estimates were based upon the Industrial Waste Profiles Study completed in 1967 and were the first of their kind to be made.

In summary, the needs show that the industrial wastewater treatment program must be primarily dedicated to the attainment of:

1. Qualification and quantification of industrial wastes and treatment practices.
2. Implementation of undemonstrated but feasible treatment methods to as many types of industries as possible.
3. Reduction of the cost of treatment by the beneficial recovery and reuse of wastewater contaminants.

Plan

The alternatives in wastewater treatment are shown in summary flow diagram below.



The alternatives shown primarily consist of:

1. Wastewater treatment (as required to abate pollution to meet water quality standards).
   a. Treatment for discharge (to meet necessary water quality criteria).
   b. Treatment for reuse (to meet industrial water quality demands to conserve water and offset the cost of treatment).
2. In-plant measures (to reduce pollutants and water discharge).
   a. Operational (housekeeping techniques and manufacturing procedures).
   b. Design (to permit water reuse and to reduce wastewater generation).
3. Residue treatment.
   a. By-product recovery (to reduce gross disposal and to utilize values).
   b. Residue stabilization (to meet environmental standards).
4. Combined methods.
   a. Joint treatment (to utilize scale factors, off-peak capacity, and synergistic effects).
   b. Others (combined 1, 2, and 3 methods as appropriate).

The alternatives best suited for implementation in specific wastewater treatment programs will depend on many factors and local conditions. Where the state-of-the-art of treatment is essentially non-existing, emphasis on treatment to meet environmental standards should prevail. For nonprogressive industries, in-plant measures should be explored for potential application. For industries which have demonstrated effective treatment methods, lower costs alternatives of treatment stressing reuse and by-product recovery should be given consideration.

Table IX lists the numerous unit operations and processes which are applicable for treatment and control of industrial wastes. The operations and processes are not readily applicable as a single method of removing all pollutants as the table indicates. More often than not several methods will be required to be used for any single wastewater.

## Goals

The overall goal of the industrial wastewater treatment research program is to provide each basic industry with the demonstrated, developed, and evaluated technology for the abatement or prevention of water pollution from individual or multiple wastewater sources. This will involve the development of new or improved methods and techniques which have potential value for industry-wide application where no methods currently exist or older but ineffective methods are now employed. In summary, the general goal is thus to upgrade the state-of-the-art for the treatment of all industrial wastewaters.

The overall general goal of the program can be divided into two broad categories of more specific aims: technical and economic.

Specific technical goals are to:

1. Define pre- and post-program state-of-the-art.
2. Establish and maintain centers of excellence to assist in state-of-the-art maintenance.
3. Develop the cooperation of industry to maintain the state-of-the-art.
4. Develop technical, design and operational guides for each industrial waste of significance.
5. Characterize industrial wastewaters and classify the pollutants into the four major categories of BOD, TOD, TDS or SS.
6. Develop comparable criteria for pollutional severity of contaminants.
7. Establish the relative severity of industrial wastewater pollutants in terms of total discharges.

In general, the specific economic goals in the wastewater treatment program are to:

1. Develop a comparable basis for the economic evaluation of industrial waste treatment.
2. Determine pre- and post-program economics of industrial wastewater treatment.
3. Show that the cost of adequate wastewater treatment will not exceed 2-4 per cent of the total cost of industrial operations.

From achievement of the above goals it will be possible to demonstrate for each industry of significance:

1. Feasibility of effective treatment (85 per cent removal) systems.

2. Effective (85 per cent removal) treatment systems within the following costs:
    a. BOD removal: 13.5¢/1000 gal or 1¢/1b BOD.
    b. TOD removal: 14¢/1000 gal or 3¢/1b TOD.
    c. TDS removal: 15¢/1000 gal or .05¢/1b TDS.
    d. SS removal : 6¢/1000 gal or 1¢.1b SS.

3. Least cost methods either directly or through inference from the results of program activities.
4. By-produce recovery and wastewater reuse as feasible methods of pollution control.
5. Total wastewater reuse and residue conversion to recover values.

### Program Organizational Outlines

The organization of the industrial wastewater treatment research program, illustrating the interrelationships of activities to meet objectives and goals, is shown on page 1-12 and in Table V. The outline form shows the program to consist of three major efforts: administration, activities development, and implementation of projects.

Table V is the Applied Science and Technology Branch program, planning, and budgeting (PPB) structure that is based on identified problem and/or research areas which are designated as subprogram elements.

Table X is a tabulation of the various EPA research laboratories with their respective research assignments which are both directly and indirectly related to industrial pollution control problem areas.

In the activities development area, grant proposals are reviewed and evaluated by EPA technical, program and regional personnel in order to determine program relevance to meet program needs. These proposals are evaluated by the criteria shown in Table XI.

The industrial program is orientated to upgrade the state-of-the-art for industrial waste treatment to the extent that industries will thereafter continue to maintain the art in a progressive manner with minimum federal R&D assistance. Therefore, it is imperative that the cooperation of industry be maintained in the ongoing phases of this program.

Figures 2, 3, and 4 show the evolution of the program to date with regard to yearly, fiscal expenditures, number of projects, and geographical distribution of industrial R&D projects. The grantees or contractors of the near 250 projects in the R&D program represent many different pollution control interests. Currently there are nearly 50 different industrial manufacturing firms, 20 municipalities and state agencies, 15 different universities, a dozen trade associations and various consulting and research firms responsible for projects in this program. This amounts to about 100 different entities.

## ORGANIZATION OUTLINE

1. Administration
    a. Centers of excellence
    b. Activities development
    c. Implementation program

2. Activities Development
    a. Centers of excellence
        (1) Technical information activities
            (a) Wastewaters characterization
            (b) Criteria for comparability of pollutants
            (c) Standards of performance
        (2) Economic bases
            (a) Demonstration grants
            (b) Industry-wide impact
    b. State-of-the-art
        (1) Initial (by contract)
        (2) Periodic (in-house)
        (3) Terminal (in-house)
    c. Cooperation of industries
        (1) Participation in implementation programs (through grants and contracts)
        (2) Development of wastewater treatment standards (in-house and with respective manufacturing association)
        (3) Maintainentance of R&D implementation
        (4) Dissemination of information

3. Implementation of Projects
    a. Research
    b. Development
    c. Demonstration and evaluation
    d. Technical-economics of wastewater treatment processes

## Schedule and Milestones

There are three major milestones to be demonstrated for each major industrial category. Attainment of these milestones will provide an upgraded state-of-the-art for industrial wastewater treatment which will allow substantial decreased federal R&D efforts to subside in favor of industry's own continued maintainence program. In this respect Figure 5 presents a graphic interpretation of the major milestones in relationship to a time frame for accomplishment.

The major milestones to be accomplished are:

1. Demonstration of the equivalence of secondary treatment for all industries of significance within each industrial category. The equivalence of secondary treatment is the removal of about 85 per cent of the primary pollutants from industrial wastewaters. (Pollutants that can be removed by primary methods).

2. Development and demonstration of the necessary treatment requirements for industrial wastewaters of significance to the extent required to meet state and local water quality criteria. In a majority of cases this requirement can be attained by the removal of up to 98 per cent of primary pollutants or the removal to a high degree (85 per cent) of secondary but significant contaminants from industrial wastewaters. (Pollutants that can be removed by secondary methods).

3. Development and demonstration of the means to control all major pollutants from all industries.

These milestones should be recognized as three significant degrees of pollution control effectiveness.

Alternative methods for achieving each milestone are undoubtably present and alternative paths of pollution control will require investigation to determine the least cost alternative for each significant industry.

With the potential that exists for total industrial pollution control for self-sustaining industrial plants, a method of achieving the third milestone is by the "zero discharge" approach or, in other words, total water reuse in a closed-loop cycle. Figure 6 is an R&D guide for the industrial program which stresses the consolidated of industrial plant utilities in a manner to permit optimum water and wastewater management. As discussed in the previous "Industrial Water Reuse" section, the closed-loop industrial water system is not only a resource conservation measure but also a method of pollution control.

## Summary

The research and development (R&D) program is directed toward developing the operational industrial waste treatment technology that cannot be expected to be developed by industry. This program is necessary to enable compliance with water quality standards and is necessary to treat joint municipal-industrial wastes effectively. The largest part of this research will deal with "innovative" treatment processes, which are needed to supplement or substitute for conventional treatment processes. Research effort also will be directed toward developing the "near-100 per cent" and "closed-loop" waste treatment systems that are increasingly needed in areas of industrial congestion which, even with high levels of treatment, discharge enormous waste loads into limited reaches of water.

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# TABLE I

## ESTIMATED VOLUME OF INDUSTRIAL WASTES BEFORE TREATMENT, 1964

| PPB Code | SIC Code | Industry Group(s) | Wastewater Volume[b] (Billion Gallons) | Process Water Intake (Billion Gallons) | Standard Biochemical Oxygen Demand (Million Pounds) | Settleable and Suspended Solids (Million Pounds) |
|---|---|---|---|---|---|---|
| 12010 | 33,34 | Metal and Metal Products | > 4,300 | 1,000 | > 480 | > 4,700 |
| 12020 | 28 | Chemical and Allied Products | 3,700 | 560 | 9,700 | 1,900 |
| 12030 | ---- | Power Production | N.A.[c] | N.A. | N.A. | N.A. |
| 12040 | 26 | Paper and Allied Products | 1,900 | 1,300 | 5,900 | 3,000 |
| 12050 | 29 | Petroleum and Coal | 1,300 | 88 | 500 | 460 |
| 12060 | 20 | Food and Kindred Products | 690 | 260 | 4,300 | 6,600 |
| 12070 | 35,36,37 | Machinery and Transportation Equip. | > 481 | 109 | > 250 | > 70 |
| 12080 | 32 | Stone, Clay, and Glass Products | (218)[d] | 88 | N.A. | N.A. |
| 12090 | 22 | Textile Mill Products | 140 | 110 | 890 | N.A. |
| 12100 | 24,25 | Lumber and Wood Products | (126)[d] | 57 | N.A. | N.A. |
| 12110 | 30 | Rubber and Plastics | 160 | 19 | 40 | 50 |
| 12120 | 12,19,21,27<br>31,38,39,72 | Miscellaneous Industrial Sources | 450 | 190 | > 390 | > 930 |
| 12000 | | All Manufacturing | ≥ 13,100 | ≥ 3,700 | ≥ 22,000 | ≥ 18,000 |
| | | For Comparison:<br>Sewered Population of U.S. | 5,300[e] | N.A. | 7,300[f] | 8,800[g] |

[a] Standard Industrial Classification
[b] Includes cooling water and steam production waters
[c] Not available or not applicable
[d] Included in total for all mfg.

[e] 120,000,000 persons x 120 gallons x 365 days
[f] 120,000,000 persons x 1/6 pounds x 365 days
[g] 120,000,000 persons x 0.2 pounds x 365 days

Source: The Cost of Clean Water, Volume II, FWPCA, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D.C., January 10, 1968.

## TABLE II

## WASTEWATER CHARACTERISTICS AND POLLUTANTS OF SELECTED INDUSTRY GROUPS*

| Liquid Waste Characteristic | Domestic | Meat Products | Canned and Frozen Foods | Sugar | Textile Mill Products | Paper and Allied Products | Basic Chemicals | Fibers Plastics and Rubbers | Fertilizer | Petroleum Refining | Leather Tanning and Finishing | Steel Rolling and Finishing | Primary Aluminum | Motor Vehicles and Parts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit Volume | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| pH |  | x |  | x | x | x | x | x | x | x | x | x | x | x |
| Acidity |  |  |  | x | x |  | x |  | x | x | x | x | x | x |
| Akalinity |  | x |  | x | x | x | x |  |  | x | x | x |  | x |
| Color |  |  |  |  | x | x | x | x |  | x | x |  |  | x |
| Odor |  |  |  |  | x |  | x | x |  | x |  |  |  | x |
| Total Solids |  | x |  | x | x | x | x | x | x |  | x | x | x | x |
| Suspended Solids | x | x | x | x | x | x | x | x |  | x | x | x |  | x |
| Temperature |  | x |  |  |  | x | x | x | x |  |  | x |  | x |
| $BOD_5$/BOD ultimate | x | x | x | x | x | x | x | x |  | x | x | x |  | x |
| COD | x |  |  |  |  |  | x | x |  | x |  | x |  | x |
| Oil & Grease |  | x |  | x | x | x | x | x |  | x |  | x |  | x |
| Detergents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (Surfacants) | x |  |  |  | x | x | x | x |  |  |  |  |  | x |
| Chloride |  | x |  |  |  | x | x | x |  | x | x | x |  | x |
| Heavy Metals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  |  |  |  |  |  | x |  |  |  |  |  |  | x |
| Chromium |  |  |  |  | x |  | x |  |  |  | x |  |  | x |
| Copper |  |  |  |  | x |  | x |  |  |  |  |  |  | x |
| Iron |  |  |  |  |  |  | x |  |  | x |  | x |  | x |
| Lead |  |  |  |  |  |  | x |  |  |  |  |  |  | x |
| Manganese |  |  |  |  |  |  | x |  |  | x |  |  |  | x |
| Nickel |  |  |  |  |  |  | x |  |  |  |  |  |  | x |
| Zinc |  |  |  |  | x |  | x |  |  |  |  |  |  | x |
| Nitrogen |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ammonia |  | x |  | x | x | x | x |  | x | x | x | x |  |  |
| Nitrate |  |  |  |  | x |  | x |  |  |  |  |  |  |  |
| Nitrite |  |  |  |  | x |  | x |  |  |  |  |  |  |  |
| Organic |  | x |  | x |  | x | x |  |  | x | x |  |  |  |
| Total |  | x |  |  | x | x | x |  | x |  | x |  |  |  |
| Phosphorus |  | x |  |  |  |  | x |  | x |  |  |  |  |  |
| Phenols |  |  |  |  | x |  | x | x |  | x |  | x |  | x |
| Sulfide |  |  |  |  | x | x | x |  |  | x | x | x |  |  |
| Turbidity | x |  |  |  | x |  | x |  |  | x |  |  |  |  |
| Sulfate |  |  |  |  | x | x | x | x |  | x | x |  |  |  |
| Thiosulfate |  |  |  |  | x |  | x |  |  |  |  |  |  |  |
| Mercaptans |  |  |  |  |  | x | x |  |  | x |  |  |  |  |
| Liginins |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Sulfur |  |  |  |  |  | x | x |  |  |  |  |  |  |  |
| Phosphates |  |  |  |  |  | x | x |  | x |  |  |  |  | x |
| Potassium |  |  |  |  |  | x | x |  |  | x |  |  |  |  |
| Calcium |  |  |  |  |  | x | x |  |  | x |  |  |  |  |
| Polysaccharides |  |  |  |  |  | x | x |  |  |  |  |  |  |  |
| Tannin |  |  |  |  |  | x |  |  |  |  | x |  |  |  |
| Sodium |  |  |  |  |  | x | x |  |  | x | x |  |  |  |
| Fluorides |  |  |  |  |  |  | x |  | x | x |  | x | x |  |
| Silica |  |  |  |  |  |  | x |  | x |  |  |  |  | x |
| Toxicity |  |  |  |  | x |  | x | x |  |  |  |  |  |  |
| Magnesium |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Ammonia |  |  |  |  |  |  | x |  | x | x |  | x |  |  |
| Cyanide |  |  |  |  |  |  | x |  |  |  | x | x |  | x |
| Thiocyanate |  |  |  |  |  |  | x |  |  |  |  | x |  |  |
| Ferrous Iron |  |  |  |  |  |  | x |  |  |  |  | x |  |  |
| Sulfite |  |  |  |  |  | x | x |  |  |  |  |  |  |  |
| Aluminum |  |  |  |  |  |  | x |  |  |  |  |  |  |  |

*Source: The Cost of Clean Water, Volume II, FWPCA, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D.C., April 1, 1968.

TABLE III

COMPARATIVE POLLUTION INDEX BASED ON
SURFACE WATER CRITERIA FOR PUBLIC WATER SUPPLIES

| Constituent or Characteristic | Permissible Criteria[a] | Desirable Criteria[b] |
|---|---|---|
| Physical: | | |
| Color (color units) | 75 | <10 |
| Odor | Narrative | Virtually absent |
| Temperature[*] | Narrative | Narrative |
| Turbidity | Narrative | Virtually absent |
| Microbiological: | | |
| Coliform organisms | 10,000/100 ml[c] | <100/100 ml[c] |
| Fecal coliforms | 2,000/100 ml[c] | <20/100 ml[c] |
| Inorganic chemicals: | | |
| Alkalinity | Narrative | Narrative |
| Ammonia | 0.5 mg/l (as N) | <0.01 mg/l |
| Arsenic[*] | 0.05 mg/l | Absent |
| Barium[*] | 1.0 mg/l | Absent |
| Boron[*] | 1.0 mg/l | Absent |
| Cadmium[*] | 0.01 mg/l | Absent |
| Chloride[*] | 250 mg/l | <25 mg/l |
| Chromium,[*] hexavalent | 0.05 mg/l | Absent |
| Copper[*] | 1.0 mg/l | Virtually absent |
| Dissolved oxygen | ≥4 mg/l (monthly mean)<br>≥3 mg/l (individual sample) | Near saturation |
| Fluoride[*] | Narrative | Narrative |
| Hardness[*] | Narrative | Narrative |
| Iron (filterable) | 0.3 mg/l | Virtually absent |
| Lead[*] | 0.05 mg/l | Absent |
| Manganese[*] | 0.05 mg/l | Absent |
| Nitrates plus nitrites[*] | 10 mg/l | Virtually absent |
| pH (range) | 6.0-8.5 | Narrative |
| Phosphorus[*] | Narrative | Narrative |
| Selenium[*] | 0.01 mg/l | Absent |
| Silver[*] | 0.05 mg/l | Absent |
| Sulfate[*] | 250 mg/l | <50 mg/l |
| Total dissolved solids[*] (filterable residue) | 500 mg/l | <200 mg/l |
| Uranyl ion[*] | 5 mg/l | Absent |
| Zinc[*] | 5 mg/l | Virtually absent |
| Organic chemicals: | | |
| Carbon chloroform extract[*] (CCE) | 0.15 mg/l | <0.04 mg/l |
| Cyanide[*] | 0.20 mg/l | Absent |
| Methylene blue active substances[*] | 0.5 mg/l | Virtually absent |
| Oil and grease[*] | Virtually absent | Absent |
| Pesticides: | | |
| Aldrin[*] | 0.017 mg/l | Absent |
| Chlordane[*] | 0.003 mg/l | Absent |
| DDT[*] | 0.042 mg/l | Absent |
| Dieldrin[*] | 0.017 mg/l | Absent |
| Endrin[*] | 0.001 mg/l | Absent |
| Heptachlor[*] | 0.018 mg/l | Absent |
| Heptachlor epoxide[*] | 0.018 mg/l | Absent |
| Lindane[*] | 0.056 mg/l | Absent |
| Methoxychlor[*] | 0.035 mg/l | Absent |
| Organic phosphates plus carbamates[*] | 0.1 mg/l[d] | Absent |
| Toxaphene[*] | 0.005 mg/l | Absent |
| Herbicides: | | |
| 2,4-D plus 2,4,5-T, plus 2,4,5-TP[*] | 0.1 mg/l | Absent |
| Phenols[*] | 0.001 mg/l | Absent |
| Radioactivity: | | |
| Gross beta[*] | 1,000 pc/l | <100 pc/l |
| Radium-226[*] | 3 pc/l | <1 pc/l |
| Strontium-90[*] | 10 pc/l[e] | <2 pc/l |
| BOD | 5 mg/l | 2 mg/l |

[*] The defined treatment process has little effect on this constituent.

[a] Permissible criteria are defined as those characteristics and concentrations of substances in raw surface waters which will allow the production of a safe, clear, potable, aesthetically pleasing, and acceptable public water supply which meets the limits of drinking water standards after treatment. This treatment may include, but will not include more than, the processes described above.

[b] Desirable criteria are defined as those characteristics and concentrations of substances in the raw surface waters which represent high-quality water in all respects for use as public water supplies. Water meeting these criteria can be treated in the defined plants with greater factors of safety or at less cost than is possible with waters meeting permissible criteria.

[c] Microbiological limits are monthly arithmetic averages based upon an adequate number of samples. Total coliform limit may be relaxed if fecal coliform concentration does not exceed the specified limit.

[d] As parathion in cholinesterase inhibition. It may be necessary to resort to even lower concentrations for some compounds or mixtures.

[e] Maximum value found in tap water analysis of 20 communities.

Source: Water Quality Criteria, FWPCA, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D.C., April 1, 1968.

## TABLE IV

## STANDARD INDUSTRIAL CLASSIFICATION OF INDUSTRIES OF SIGNIFICANCE FOR WATER POLLUTION

### PART I HEAVY INDUSTRIES SECTION

| CODE | |
|---|---|
| 22 | TEXTILE MILL PRODUCTS |
| 221 | Weaving mills, cotton |
| 2221 | Weaving mills, synthetics |
| 2231 | Weaving, finishing mills, wool |
| 225 | Knitting mills |
| 226 | Textile finishing, except wool |
| 2261 | Finishing plants, cotton |
| 2262 | Finishing plants, synthetic |
| 2269 | Finishing plants, n.e.c. |
| 228 | Yarn and thread mills |
| 229 | Miscellaneous textile goods |
| | |
| 28 | CHEMICALS AND ALLIED PRODUCTS |
| 281 | Basic chemicals |
| 2812 | Alkalies and chlorine |
| 2815 | Intermediate coal tar product |
| 2818 | Organic chemicals, n.e.c. |
| 2819 | Inorganic chemicals, n.e.c. |
| 282 | Fibers, plastics, rubbers |
| 2821 | Plastics materials & resins |
| 2822 | Synthetic rubber |
| 2823 | Cellulosic man-made fibers |
| 2824 | Organic fibers, noncellulosic |
| 283 | Drugs |
| 2834 | Pharmaceutical preparations |
| 284 | Cleaning and toilet goods |
| 2841 | Soap and other detergents |
| 2851 | Paints and allied products |
| 2861 | Gum and wood chemicals |
| 287 | Agricultural chemicals |
| 2871 | Fertilizers |
| 2879 | Agricultural chemicals, n.e.c. |
| 289 | Miscellaneous chemical products |
| 2891 | Glue and gelatin |
| 2892 | Explosives |
| 2899 | Chemical preparations, n.e.c. |
| | |
| 29 | PETROLEUM AND COAL PRODUCTS |
| 2911 | Petroleum refining |
| 295 | Paving and roofing materials |
| 2951 | Paving mixtures and blocks |
| 2952 | Asphalt felts and contings |
| | |
| 30 | RUBBER AND PLASTICS PRODUCTS, n.e.c. |
| 3011 | Tires and inner tubes |
| 3069 | Rubber products, n.e.c. |
| 3079 | Plastics products, n.e.c. |
| | |
| 33 | PRIMARY METAL INDUSTRIES |
| 331 | Steel rolling and finishing |
| 3312 | Blast furnaces and steel mills |
| 3315 | Steel wire drawing, etc. |
| 3317 | Steel pipe and tube |
| 332 | Iron and steel foundries |
| 333 | Primary nonferrous metal |
| 3331 | Primary copper |
| 3332 | Primary lead |
| 3334 | Primary aluminum |
| 3341 | Secondary nonferrous metals |
| 335 | Nonferrous rolling and drawing |
| 336 | Nonferrous foundries |
| 339 | Primary metal industries, n.e.c. |

| CODE | |
|---|---|
| 34 | FABRICATED METAL PRODUCTS |
| 3411 | Metal cans |
| 342 | Cutlery, hand tools, hardware |
| 343 | Plumbing and heating, except electric |
| 344 | Structural metal products |
| 345 | Screw machine products, bolts, etc. |
| 3461 | Metal stampings |
| 347 | Metal services, n.e.c. |
| 3471 | Plating and polishing |
| 3481 | Fabricated wire products, n.e.c. |
| 349 | Fabricated metal products, n.e.c. |
| | |
| 35 | MACHINERY, EXCEPT ELECTRICAL |
| 351 | Engines and turbines |
| 3522 | Farm machinery and equipment |
| 353 | Construction and like equipment |
| 354 | Metalworking machinery |
| 355 | Special industry machinery |
| 356 | General industrial machinery |
| 357 | Office machines, n.e.c. |
| 358 | Service industry machines |
| 3599 | Miscellaneous machinery |
| | |
| 36 | ELECTRICAL MACHINERY |
| 361 | Electric distribution products |
| 363 | Electric industrial apparatus |
| 363 | Household appliances |
| 364 | Lighting and wiring devices |
| 365 | Radio and TV receiving equipment |
| 366 | Communication equipment |
| 367 | Electronic components |
| 369 | Electrical products, n.e.c. |
| | |
| 37 | TRANSPORTATION EQUIPMENT |
| 371 | Motor vehicles and parts |
| 372 | Aircraft and parts |
| 373 | Ship and boat building |
| 374 | Railroad equipment |
| | |
| 38 | INSTRUMENTS AND RELATED PRODUCTS |
| 3811 | Scientific instruments |
| 382 | Mechanical measuring devices |
| 384 | Medical instruments and supplies |

(continued)

## PART II FOOD PAPER AND OTHER INDUSTRIES SECTION

| CODE | |
|---|---|
| 20 | FOOD AND KINDRED PRODUCTS |
| 201 | Meat products |
| 2011 | Meat slaughtering plants |
| 2013 | Meat processing plants |
| 2015 | Poultry dressing plants |
| 202 | Dairies |
| 2021 | Creamery butter |
| 2022 | Natural and Process cheese |
| 2023 | Condensed and evaporated milk |
| 2024 | Ice cream and frozen desserts |
| 2026 | Fluid milk |
| 203 | Canned and frozen foods |
| 2031 | Canned and cured seafoods |
| 2032 | Canned specialties |
| 2033 | Canned fruits and vegetables |
| 2034 | Dehydrated foods products |
| 2035 | Pickles, sauces, salad dressings |
| 2036 | Fresh or frozen packaged fish |
| 2037 | Frozen fruits and vegetables |
| 204 | Grain mills |
| 2041 | Flour mills |
| 2042 | Prepared animal feeds |
| 2043 | Cereal preparations |
| 2046 | Wet corn milling |
| 205 | Bakery products |
| 2051 | Bread and related products |
| 2052 | Biscuit, crackers, and cookies |
| 206 | Sugar |
| 2061 | Raw cane sugar |
| 2062 | Cane sugar refining |
| 2063 | Beet sugar |
| 207 | Candy and related products |
| 208 | Beverages |
| 2082 | Malt liquors |
| 2083 | Malt |
| 2084 | Wines and brandy |
| 2085 | Distilled liquor, except brandy |
| 2086 | Bottled and canned sort drinks |
| 2087 | Flavorings |
| 209 | Miscellaneous foods and kindred products |
| 2091 | Cottonseed oil mills |
| 2092 | Soybean oil mills |
| 2094 | Animal and marine fats and oils |
| 2096 | Shortening and cooking oils |
| 2095 | Roasted coffee |
| 2099 | Food preparations, n.e.c. |

| CODE | |
|---|---|
| 21 | TOBACCO MANUFACTURES |
| 2111 | Cigaretts |
| 24 | LUMBER AND WOOD PRODUCTS |
| 242 | Sawmills and planing mills |
| 2421 | Sawmills and planing mills |
| 243 | Millwork and related products |
| 249 | Miscellaneous wood products |
| 25 | FURNITURE AND FIXTURES |
| 26 | PAPER AND ALLIED PRODUCTS |
| 2611 | Pulp mills |
| 2621 | Paperboard mills |
| 264 | Paper and paperboard products |
| 2641 | Paper coating and glazing |
| 2646 | Pressed and molded pulp goods |
| 265 | Paperboard containers and boxes |
| 2654 | Sanitary food containers |
| 2661 | Building paper and board mills |
| 31 | LEATHER AND LEATHER PRODUCTS |
| 3111 | Leather tanning and finishing |
| 32 | STONE, CLAY, AND GLASS PRODUCTS |
| 3211 | Flat glass |
| 322 | Pressed and blown glassware |
| 3241 | Cement, hydraulic |
| 325 | Structural clay products |
| 326 | Pottery and related products |
| 327 | Concrete and plaster products |
| 3273 | Ready mixed concrete |
| 3274 | Lime |
| 3275 | Gypsum products |
| 3281 | Cut stone and stone products |
| 329 | Nonmetallic mineral products |
| 3291 | Abrasive products |
| 3292 | Asbestos products |
| 3295 | Minerals, ground or treated |
| 3861 | Photographic equipment |
| 39 | MISCELLANEOUS MANUFACTURING |

## Table V
## Research, Development & Demonstration Program Structure
## Environmental Protection Agency
## Office of Research and Monitoring
## Technology Division

### Applied Science and Technology Branch
William J. Lacy, Chief

| Mining Industry Section HALL | Heavy Industries Section REY | Food, Paper and Other Industries Section KEELER | Agricultural and Marine Section BERNARD |
|---|---|---|---|
| 1401 Mine Drainage | 1201 Metal and Metal Products | 1204 Paper and Allied Prod. | 1301 Forestry & Logging |
| 1402 Oil Production | 1202 Chemicals and Allied Prod. | 1206 Food and Kindred Prod. | 1302 Agri. Run-off |
| 1403 Oil Shale | 1203 Power Production | 1208 Stone, Clay & Glass Prod. | 1303 Irrigation Return Flows |
| 1404 Other Mining Sources | 1205 Petroleum and Coal Products | 1210 Lumber & Wood Products | 1304 Animal Feed Lots |
| 1405 Phosphate Mining | 1207 Machinery and Trans. Equip. | 1212 Misc. Industrial Sources | 1305 Non-sewered Rur. Waste |
| 1503 Construction Projects | 1209 Textiles | | 1506 Natural Run-off |
| 1507 Dredging | 1211 Rubber and Plastic | | 1501 Recreational |
| 1511 Land Fill | 1213 Joint Ind./Municipal Wastes | | 1502 Watercraft Wastes |
| | 1613 Thermal Pollution | | 1506 Natural Run-off |
| | | | 1508 Oil Pollution Spills |
| | | | 1509 Hazardous Material Spills |

TABLE VI

INDUSTRIAL POLLUTION PRIORITY RANKINGS

| Sub-program Element | Industry Identity | Based on Total Wastewater Volume[a] | Based on BOD Loads[a] (Before Treatment) | Based on Suspended Solids Loads[a] (Before Treatment) | Based on 1967-68 FWPCA National Priorities | Based on EPA Program Costs To July 1971 |
|---|---|---|---|---|---|---|
| 12010 | Metal and Metal Products | 1 | 6 | 2 | 6 | 5 |
| 12020 | Chemical and Allied Products | 2 | 1 | 4 | 4 | 4 |
| 12030 | Power Production[b] | N.A.[c] | N.A. | N.A. | 2 | N.A. |
| 12040 | Paper and Allied Products | 3 | 2 | 3 | 1 | 2 |
| 12050 | Petroleum and Coal | 4 | 5 | 6 | 5 | 7 |
| 12060 | Food and Kindred Products | 5 | 3 | 1 | 3 | 1 |
| 12070 | Machinery and Transportation Equip. | 6 | 8 | 7 | — | 11 |
| 12080 | Stone, Clay, and Glass Products | 8 | — | — | — | 10 |
| 12090 | Textile Mill Products | 10 | 4 | — | 7 | 6 |
| 12100 | Lumber and Wood Products | 11 | — | — | 9 | 9 |
| 12110 | Rubber and Plastic Products | 9 | 9 | 8 | — | 12 |
| 12120 | Miscellareous Industrial Sources | 7 | 7 | 5 | 8 | 8 |
| 12130 | Joint Industrial-Municipal Wastes | — | — | — | — | 3 |

[a] Source: The Cost of Clean Water, Volume II, FWPCA, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D.C., January 10, 1968.

[b] Thermal pollution aspects, prior to July 1971, were not included in 12030 program.

[c] Not available or not applicable.

## TABLE VII

## POLLUTION CONTROL PROGRAM SUMMARY

Cost for Pollution Abatement by 1973 (Billions of Dollars)

| Pollution Control Program | Current Capital Investment | Required Capital Investment (1967-1973) | Operation and Maintenance (1967-1973) | Total (Req. Cap. Inv. + O&M) | Relative Gross Pollution Load (BOD Basis) | Present Gross Load Treated (1962-1964) | Relative Wastewater Volume | Waste Type | Projected Total Water Use Increase (% Change: 1954-2000) |
|---|---|---|---|---|---|---|---|---|---|
| Industrial Pollution Control | 2.4 - 2.9 | 2.5 - 4.5 | 3.0 - 3.9[a] | 5.5 - 8.4 | 3.0[b] | ~35% | 0.71[c] | All types | 716 |
| Municipal Pollution Control[d] | ~40.0 | 8.0 - 8.7 | 1.4 - 1.7[e] | 9.4 - 10.4 | 1.0[f] | ~40% | 1.0 | Primarily Domestic | 238 |
| Combined Sewer and Storm Overflow Control | ≥ 60.0[g] | 6.2[h]<br>25.0[i]<br>49.0[j] | N.A.[k]<br>N.A.<br>N.A. | ≥ 6.2<br>≥ 25.0<br>≥ 49.0 | 0.4<br>0.1[l] | ~60%<br>N.A. | 0.1[m] | Domestic | 238 |

[a] 0.35 - 0.43 in 1967.

[b] Currently jointly treated.

[c] Process waters only: 0.18 jointly.

[d] Includes joint treatment.

[e] 0.2 in 1967.

[f] Based on 120 million sewered population.

[g] For waste collection systems.

[h] For sanitary sewers.

[i] Storm sewer requirements for urban areas.

[j] Complete separation of combined sewers into sanitary and storm sewers.

[k] Not applicable or not available.

[l] For overflows of combined systems.

[m] For overflows.

Source: The Cost of Clean Water, Volume II, FWPCA, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D.C., January 10, 1968.

## TABLE VIII

### TOTAL CURRENT VALUE OF WASTE TREATMENT REQUIREMENTS OF MAJOR INDUSTRIAL ESTABLISHMENTS[a]

| Industry | Value (Millions of 1968 Dollars) | |
|---|---|---|
| | Fiscal 1969 (Estimate) | Fiscal 1973 (Census Projection) |
| Food and Kindred Products | 743.1 | 669.6 |
| Textile Mill Products | 165.2 | 170.9 |
| Paper and Allied Products | 321.8 | 917.6 |
| Chemical and Allied Products | 379.7 | 1003.8 |
| Petroleum and Coal | 379.4 | 272.3 |
| Rubber and Plastics | 41.1 | 58.9 |
| Primary Metals | 1473.8 | 1383.7 |
| Machinery | 39.0 | 55.9 |
| Electrical Machinery | 35.8 | 51.3 |
| Transportation Equipment | 216.0 | 156.4 |
| All Other Manufacturing | 203.7 | 291.8 |
| Total Capital Requirement | 3998.6 | 5032.2 |
| Plant Currently Provided: | | |
| By Industry | 2215.3 | 1752.3 |
| Through Municipal Facilities | 731.4 | 635.9 |
| Current Backlog | 1051.9 | 2644.0 |

[a] At least 85 per cent reduction of standard biochemical oxygen demand (determined according to the five-day test) and of settleable and suspended solids is assumed.

Source: The Cost of Clean Water, Volume II, FWPCA, U.S. Department of the Interior, U.S. Government Printing Office, Washington, D.C., January 10, 1968.

## TABLE IX

## UNIT OPERATIONS AND PROCESSES APPLICABLE TO TREATMENT AND CONTROL OF INDUSTRIAL WATER POLLUTION

| | Dissolved BOD Removed | Suspended and Colloidal Solids Removal | Dissolved Refractory Organics Removal | Dissolved Inorganics Removal | Dissolved Nutrient Removal | Microorganisms Removal | Concentrate Removal |
|---|---|---|---|---|---|---|---|
| **Biological Processes:** | | | | | | | |
| Activated Sludge | x | x | -- | -- | -- | x | -- |
| Anaerobic Digestion | x | x | -- | -- | -- | -- | x |
| Bio-Filters | x | -- | -- | -- | x | -- | -- |
| Biomass Treatment (Algae Harvesting) | x | -- | -- | -- | x | -- | x |
| Biological $PO_4$ Removal | x | -- | -- | -- | x | -- | -- |
| Extended Aeration: | | | | | | | |
| Bio-Denitrification | L* | -- | L | -- | x | -- | -- |
| Bio-Nitrification | x | x | -- | | -- | -- | -- |
| Pasveer Oxidation Ditch | x | x | -- | -- | -- | x | -- |
| Chemical Processes: | | | | | | | |
| Chemical Oxidation: | | | | | | | |
| Catalytic Oxidation | x | x | x | -- | -- | x | -- |
| Chlorination | x | x | x | -- | -- | x | -- |
| Ozonation | L | -- | x | -- | -- | x | -- |
| Wet Oxidation | x | x | x | -- | -- | x | -- |
| Chemical Precipitation | -- | -- | x | x | x | -- | -- |
| Chemical Reduction | -- | -- | -- | -- | x | -- | -- |
| Coagulation: | | | | | | | |
| Inorganic Chemicals | x | x | -- | -- | x | x | -- |
| Polyelectrotytes | x | x | -- | -- | -- | x | -- |
| Disinfection | -- | -- | -- | -- | -- | x | -- |
| Electrolytic Processes: | | | | | | | |
| Electrodialysis | -- | -- | -- | x | x | x | -- |
| Electrolysis | -- | -- | x | x | -- | -- | -- |
| Extractions: | | | | | | | |
| Ion Exchange | -- | -- | -- | x | x | -- | -- |
| Liquid-Liquid (Solvent) | -- | -- | x | x | -- | -- | -- |
| Incineration: | | | | | | | |
| Fluidized-Bed | x | x | x | -- | -- | x | x |
| **Physical Processes:** | | | | | | | |
| Carbon Adsorption: | | | | | | | |
| Granular Activated | x | -- | x | -- | -- | -- | -- |
| Powdered | x | x | x | -- | -- | x | -- |
| Distillation | x | x | x | x | x | x | -- |
| Filtration: | | | | | | | |
| Coal Filtration | L | x | -- | -- | -- | x | -- |
| Diatomauous Earth Filtration | -- | x | -- | -- | -- | x | -- |
| Dual- Media Filtration | -- | x | -- | -- | -- | x | -- |
| Micro-Screening | -- | x | -- | -- | -- | x | -- |
| Sand Filtration | -- | x | -- | -- | -- | x | -- |
| Flocculation-Sedimentation | -- | x | -- | -- | -- | x | -- |
| Foam Separation | -- | x | x | x | -- | -- | -- |
| Freezing | x | -- | x | x | x | -- | -- |
| Gas Hydration | x | -- | x | x | x | -- | -- |
| Reverse Osmosis | x | x | x | x | x | x | -- |
| Stripping (Air or Steam) | x | x | x | -- | x | -- | -- |

*Under specific conditions there will be limited effectiveness

# TABLE X

## SPECIAL-PURPOSE RESEARCH ASSIGNMENTS FOR FIELD LABORATORIES

| Laboratory | Research Assignments |
|---|---|
| Robert S. Kerr Water Research Center<br>Ada, Oklahoma<br>Wm. C. Galegar<br>Director | Treatment and Control Research - Experimental application of technology for treatment, control, or prevention of pollution from:<br>(1) petrochemical industry<br>(2) oil production<br>(3) petroleum refining<br>(4) irrigation return flows<br>(5) impoundments<br>(6) meat processing (excluding poultry)<br>Water Quality Control Research - Development of technology for control of pollution by means other than waste treatment (e.g., process change, dilution, dispersion, environmental treatment, etc.).<br>Ground Water Pollution Research - Research on fate of pollution in ground water, ultimate disposal of waste concentrates under the ground, soil treatment, soil chemistry and microbiology and ground water recharge. |
| Southeast Water Laboratory<br>Athens, Georgia<br>D. W. Dutweiler<br>Director | Treatment and Control Research - Experimental application of technology for treatment, control, or prevention of pollution from:<br>(1) agriculture run-off<br>(2) pesticide manufacture<br>(3) fertilizer manufacture<br>(4) phosphate mining<br>(5) textile mills<br>(6) poultry processing<br>(7) citrus processing<br>Pollution Identification Research - Research on physical and chemical analytical methods for detecting, measuring, characterizing and indicating pollution.<br>Pollution Source and Fate Research - Research on methods for identifying and measuring sources of pollution and on the fate of pollution in streams and lakes. |

TABLE X (continued)

| Laboratory | Research Assignments |
|---|---|
| Robert A. Taft Water Research Center<br>Cincinnati, Ohio<br>John J. Convery<br>Director | Municipal Waste Treatment Research - Experimental application of technology for treatment, control, or prevention of pollution from:<br>(1) municipal sewers<br>(2) unsewered homes |
| | Physical-Chemical Treatment Research - Development of technology for physical-chemical separation, modification, or destruction of impurities in wastewaters. |
| | Biological Treatment Research - Development of technology for biological separation, modification, or destruction of impurities in wastewaters. |
| | Ultimate Disposal Research - Development of technology for the non-pollutional disposal of waste concentrates except for underground disposal. |
| Alaska Water Lab.<br>College, Alaska<br>R. W. Lattimer<br>Director | Cold Climate Research - Research on pollution in the Arctic environment. |
| Pacific Northwest Water Laboratory<br>Corvallis, Oregon<br>N. A. Jaworski<br>Director | Treatment and Control Research - Experimental application of technology for treatment, control, or prevention of pollution from:<br>(1) power production (thermal pollution)<br>(2) bakery products<br>(3) paper and allied products<br>(4) lumber and wood products<br>(5) logging operations<br>(6) food processing (excluding meat, poultry, and citrus) |
| | Eutrophication Research - Development of technology for the control and prevention of accelerated eutrophication. |
| | Coastal Pollution Research - Research on fate of pollution in estuarial and coastal waters. |

TABLE X (continued)

| Laboratory | Research Assignments |
|---|---|
| National Water Quality Laboratory<br>Duluth, Minnesota<br>D. I. Mount<br>Director | Fresh Water Quality Requirements Research - Determination of physical, chemical, and biological water quality requirements for all fresh water uses (municipal, industrial, agricultural, and recreational) and for propagation of fish, other aquatic life, and wildlife. |
| National Marine Water Quality Laboratory<br>West Kingston, R.I.<br>Clarence Tarzwell<br>Director | Marine Water Quality Requirements Research - Determination of physical, chemical, and biological water quality requirements for all marine water uses (industrial and recreational) and for propagation of fish, other aquatic life, and wildlife. |
| Edison Water Quality Laboratory<br>Edison, New Jersey<br>P.B. Lederman<br>Director | Oil Spill Research - Development of technology for the prevention, detection, monitoring, containment, treatment, and recovery of petroleum products spilled into the water environment.<br>Hazardous Materials Spill Research - Development of technology for the prevention, detection, monitoring, containment, treatment, and recovery of hazardous polluting chemicals spilled into the water environment.<br>Storm and Combined Sewer Overflow Research - Development of technology for the management, treatment, and control of pollution generated by wet weather conditions.<br>Metal and Metal Products Research - Development of technology for the prevention, treatment, and recovery of metal finishing wastes.<br>Vessel Pollution Research - Development of technology for the prevention, treatment, and monitoring of wastes from watercraft. |
| Grosse Ile Field Station<br>Grosse Ile, Michigan | Lake Pollution Research - Research on the fate of pollutants in large lakes. |

TABLE X (continued)

| Laboratory | Research Assignments |
|---|---|
| Grosse Ile Field Station (continued) | Treatment and Control Research - Experimental application of technology for treatment control or abatement pollution from:<br>(1) metal and metal products industries<br>(2) inorganic chemical industries<br>(3) machinery and transportation equipment industries<br>(4) rubber and plastics industries<br>(5) mining<br>(a) salt<br>(b) taconite<br>(6) dredging |

TABLE XI

## PROPOSAL EVALUATION CRITERIA

1. Extent of industry-wide applicability of results.

2. The extent the proposed work can be considered as a new or improved method of pollution control.

3. The amount of risk involved, i.e. the probability of success.

4. The long range benefits to be derived by the grantee.

    a. Research - minimum grantee benefits - maximum support by EPA.
    b. Development - partial grantee benefits - partial support by EPA.
    c. Demonstration - maximum grantee benefits - minimum support by EPA.

5. The extent to which the project will provide solutions to the national pollution problem.

6. The capability of the grantee for promoting broad application of results of a successful project. (e.g. sponsorship of a national association)

7. Thoroughness of work plan, qualifications of project director and support personnel, facilities available, testing, and analysis.

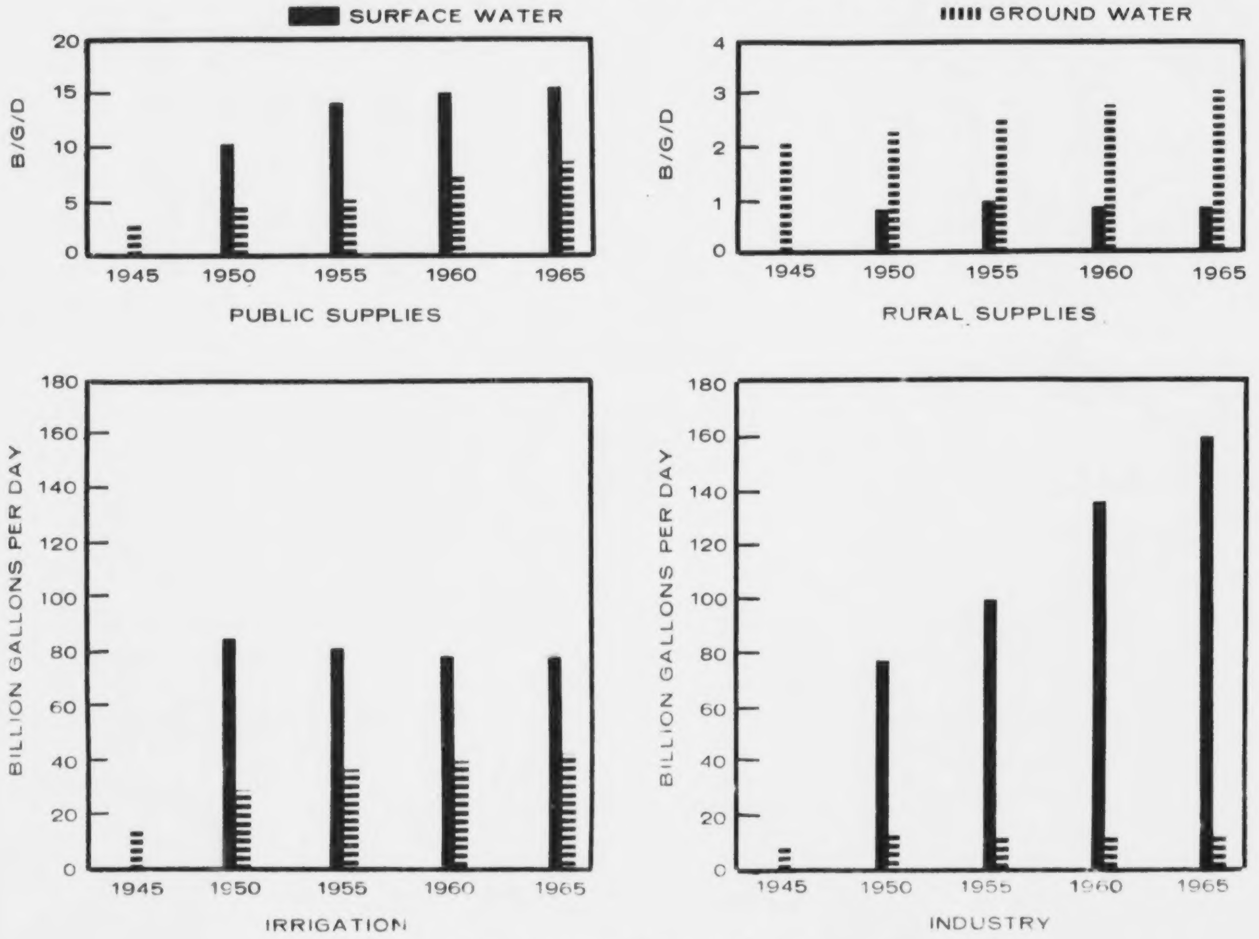
8. The extent of outside interest expressed - particularly in dollar support.

9. Reasonableness of the costs proposed.

10. For proposals qualifying for EPA support, based on the above, the distribution of EPA participation is allocated in a manner to provide appropriate administrative and fiscal control of the project during its course. This is accomplished by allowing greater EPA contributions toward the technical requirements (i.e. engineering services), lesser percentage contributions toward operational requirements (i.e. operation and maintenance costs), and minimum percentage contribution toward capital items (i.e. equipment and construction).

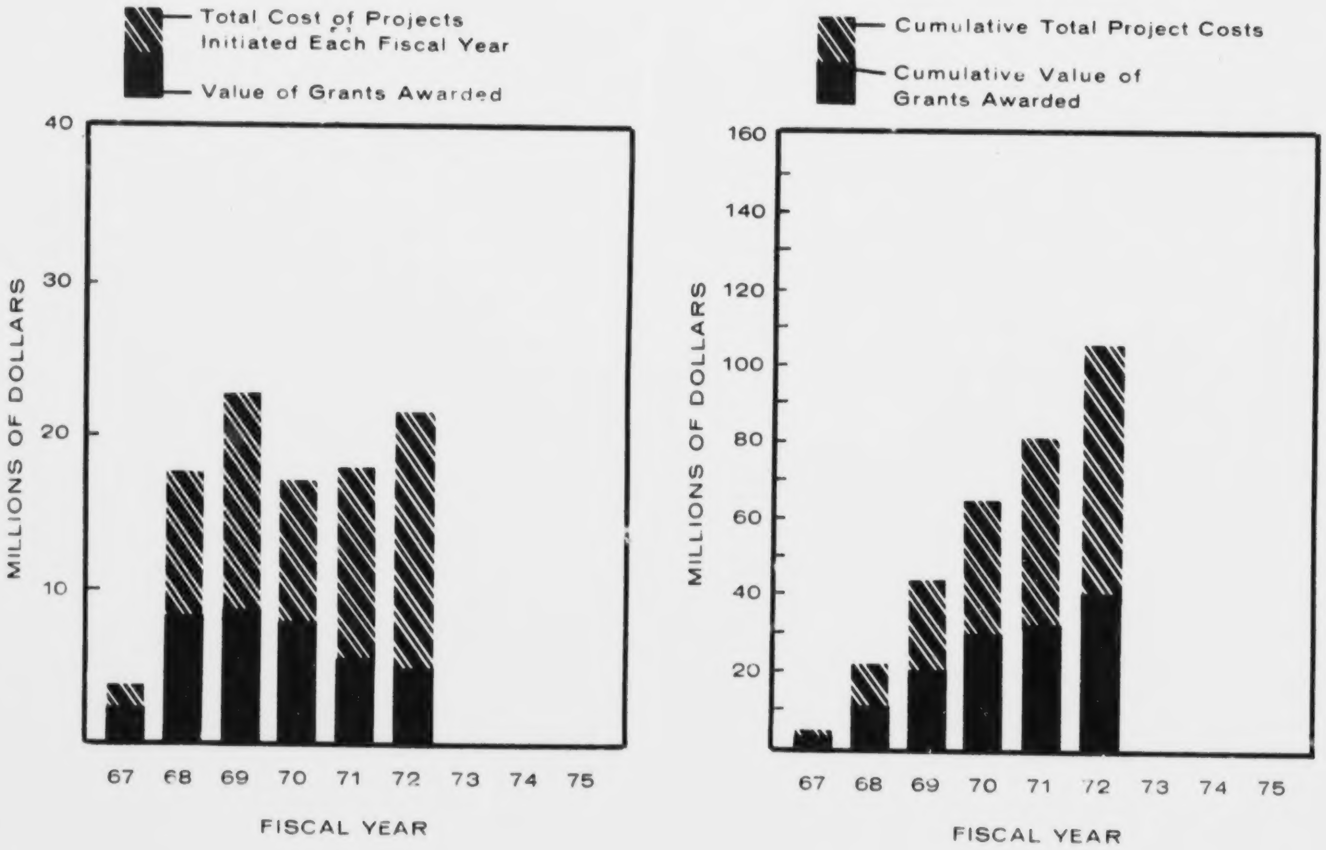
FIGURE 1

TRENDS IN USE OF WATER FOR PUBLIC SUPPLIES, RURAL SUPPLIES, IRRIGATION, AND INDUSTRY, 1945-65



Note: Surface-water data for 1945 not available

FIGURE 2
FUNDING LEVELS BY FISCAL YEAR
OF
INDUSTRIAL POLLUTION CONTROL PROJECTS



## FIGURE 3

## INDUSTRIAL POLLUTION CONTROL PROGRAM

## PROJECT ACTIVITY

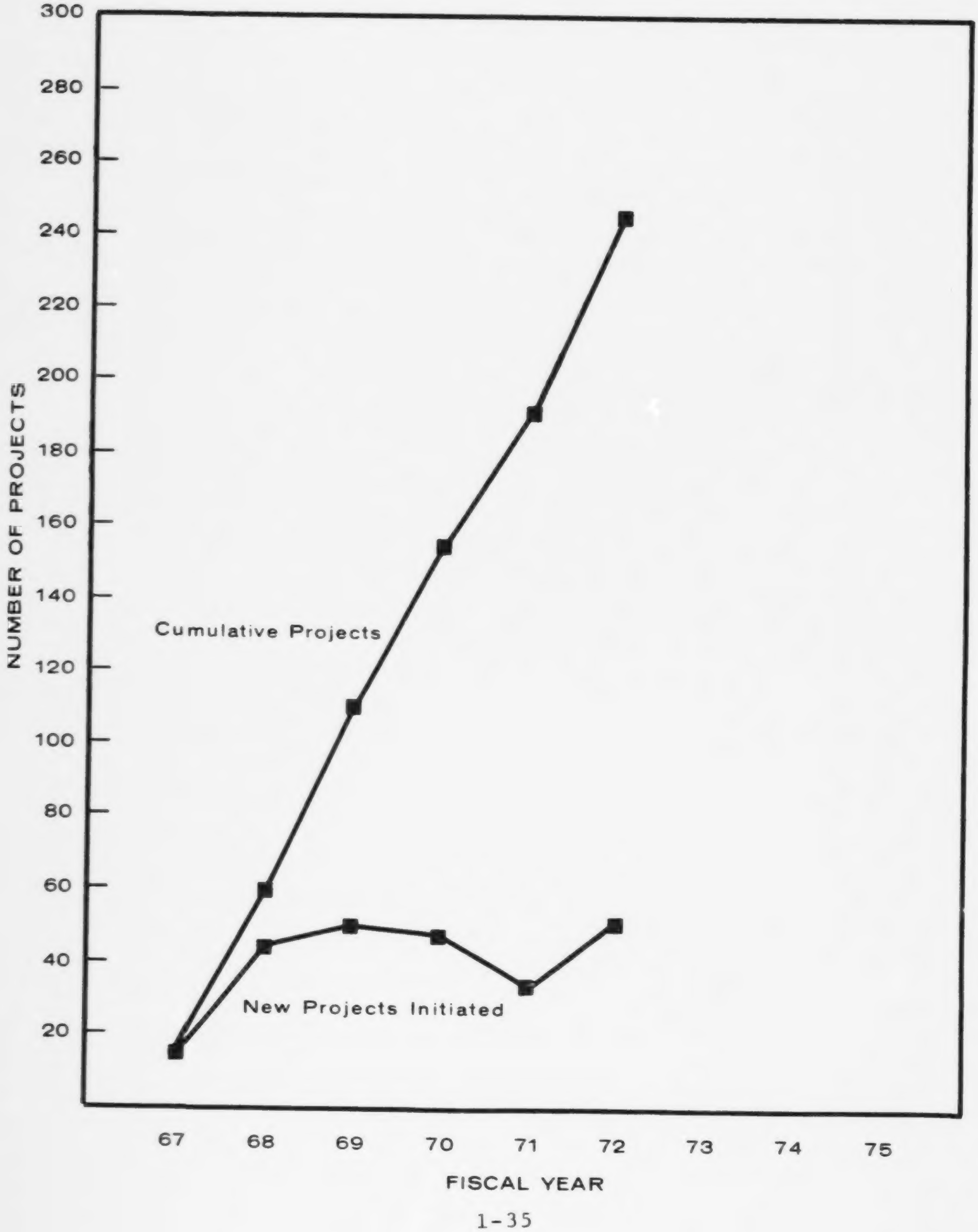
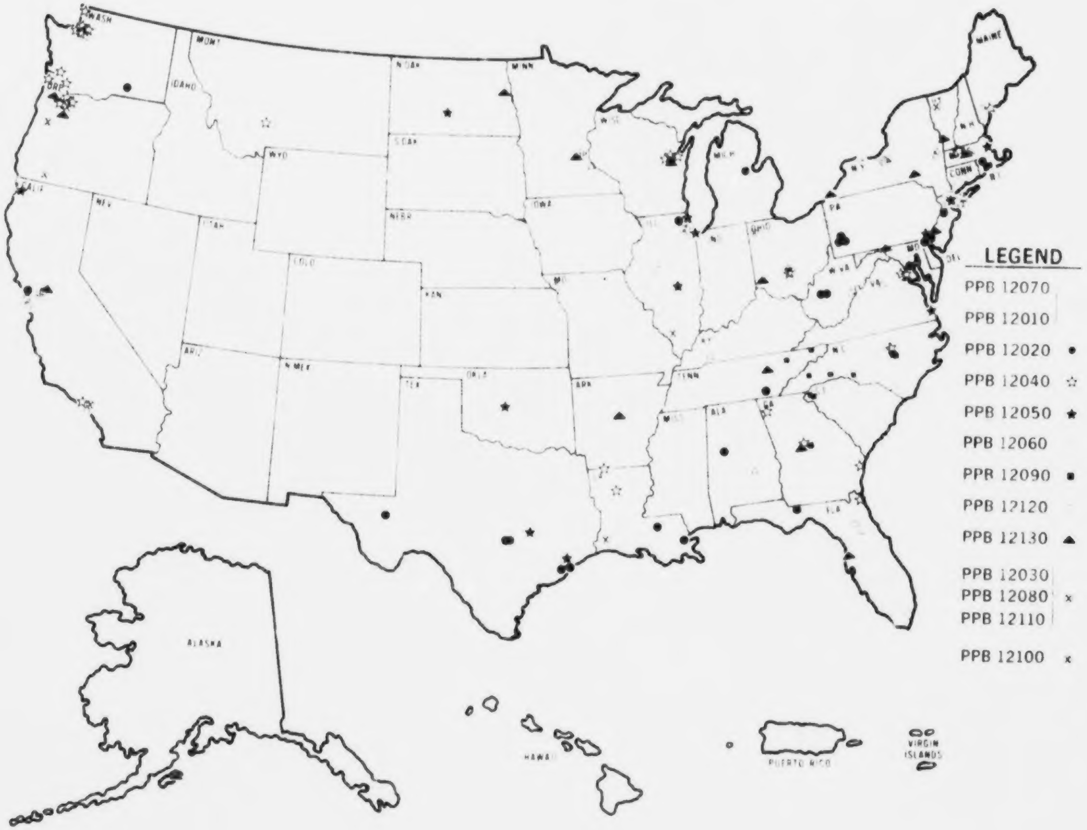


FIGURE 4

LOCATION OF

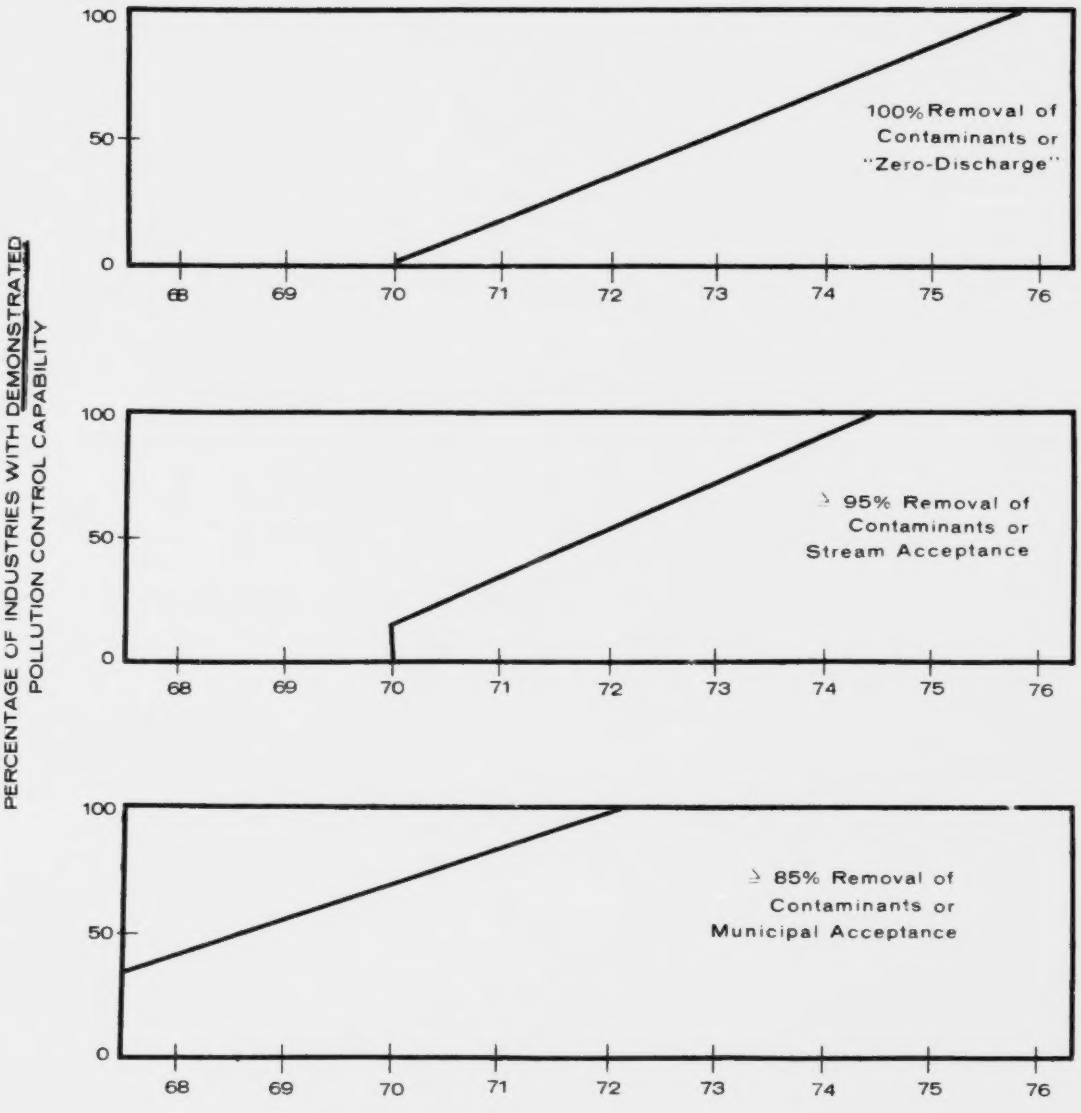
INDUSTRIAL POLLUTION CONTROL

RESEARCH, DEVELOPMENT, AND DEMONSTRATION CONTRACTS AND GRANTS


LEGEND
PPB 12070
PPB 12010
PPB 12020 ●
PPB 12040 ☆
PPB 12050 ★
PPB 12060
PPB 12090 ■
PPB 12120
PPB 12130 ▲
PPB 12030
PPB 12080 ×
PPB 12110
PPB 12100 ×
WASH
MONT
N DAK
MINN
ORE
IDAHO
WYO
S DAK
WISC
MICH
N Y
MAINE
N H
CONN
CALIF
NEV
UTAH
COLO
NEBR
IOWA
ILL
OHIO
PA
W VA
KAN
N C
TENN
ARIZ
N MEX
OKLA
ARK
TEX
MISS
ALA
FLA
ALASKA
HAWAII
PUERTO RICO
VIRGIN ISLANDS

## FIGURE 5

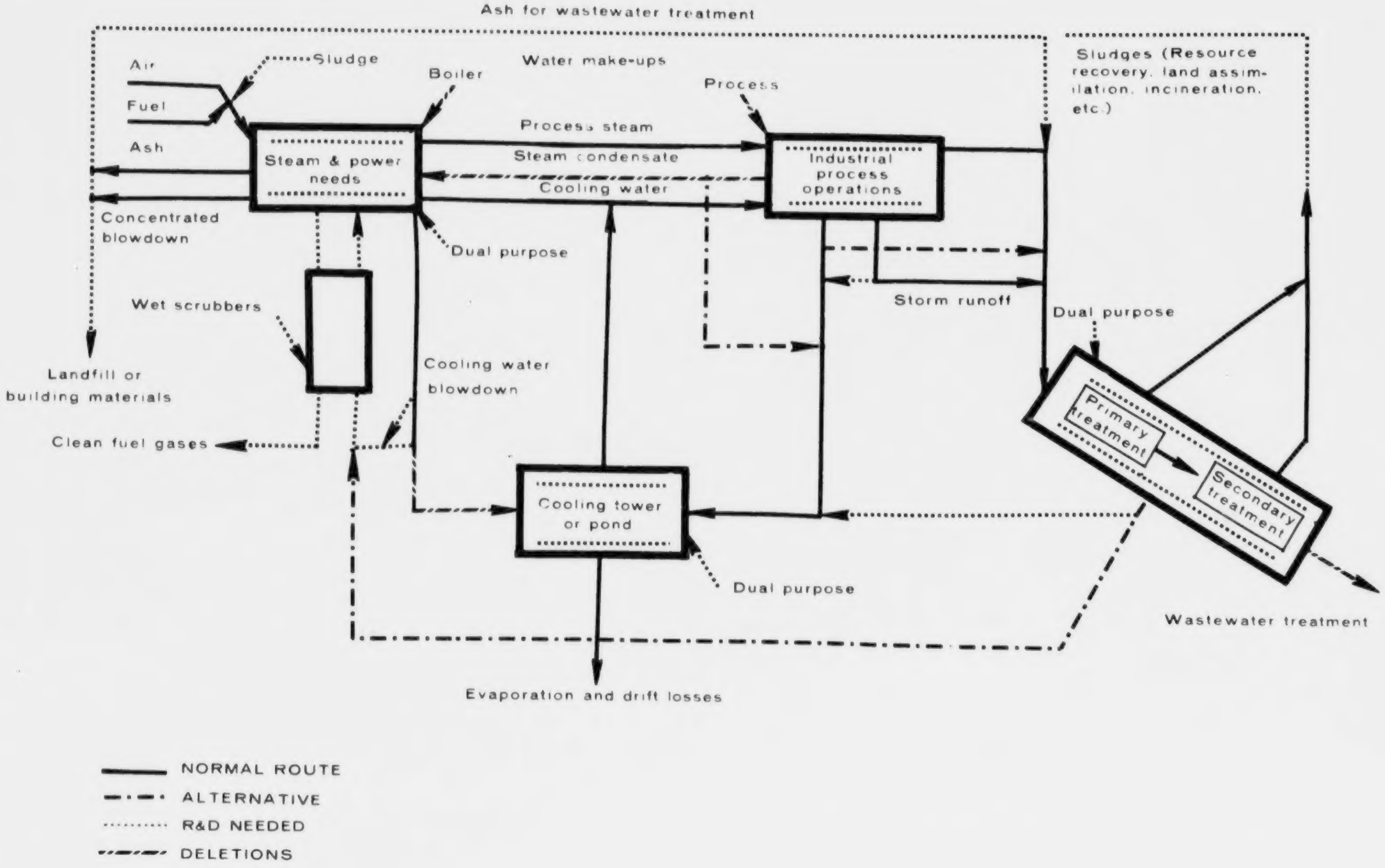
## INDUSTRIAL POLLUTION CONTROL MILESTONES*



*Based on Expenditure of Resources According to Congressional Authorization in the Clean Water Restoration Act of 1966.

FIGURE 6

INDUSTRIAL WASTEWATER REUSE SCHEME


Ash for wastewater treatment
Air
Fuel
Ash
Sludge
Boiler
Water make-ups
Process
Sludges (Resource recovery, land assimilation, incineration, etc.)
Steam & power needs
Process steam
Steam condensate
Cooling water
Industrial process operations
Concentrated blowdown
Dual purpose
Storm runoff
Dual purpose
Wet scrubbers
Landfill or building materials
Cooling water blowdown
Clean fuel gases
Primary treatment
Secondary treatment
Cooling tower or pond
Dual purpose
Wastewater treatment
Evaporation and drift losses
NORMAL ROUTE
ALTERNATIVE
R&D NEEDED
DELETIONS

PPB 12010

# METAL AND METAL PRODUCTS

## PPB 12010

## METAL AND METAL PRODUCTS

Three broad categories of industrial activities are included in this subprogram element of the EPA Research & Monitoring Program. These are the ferrous metals industries, the nonferrous metals industries, and metal fabrication and finishing operations other than those related to PPB 12070.

The steel industry uses approximately 18 billion gallons of water per day or 19 per cent of the total industrial water usage. Most of the water is used for non-contact cooling purposes. Approximately 2.9 billion gallons per day are used in processing operations such as coke-oven gas scrubbing, blast-furnace gas washing, basic oxygen gas scrubbing, hot rolling, pickling and rinsing, cold rolling, and dipping and other finishing operations. These operations contaminate the water with large amounts of particulate matter, oil, acid, soluable salts, ammonia, cyanide, phenols, and other organic and mineral compounds. Most of the waste streams are better suited for chemical and/or physical treatment methods rather than biological methods. In addition to the usual R&D program objectives of improved treatment process efficiency at reduced costs and increased water reuse and by-product recovery, an additional objective in the ferrous metals industry is the determination of the cost of waste treatment not only for each major processing operation, but also the total treatment costs per unit of product. Grant priorities are for demonstration of closed loop systems, by-product recovery and high water reuse (decreased effluent loads), and development of improved waste treatment technology. The objectives of grant projects are to obtain raw waste loads per unit of production, technology applicable to a broad segment of industry, treatment system economics, the resolution of a specific industrial waste problem. The principle geographical areas of activity are indicated on p. 2-7.

The nonferrous metals industries include aluminum, copper, zinc, lead, nickel, and many others. These industries use approximately 1.5 billion gallons of water per day. Like the steel industry the wastes are high in particulate and mineral compounds and are best treated by chemical and/or physical means. The principle geographical areas of activity in the aluminum industry are indicated on p. 2-8.

There are over 12,000 captive and independent metal finishing operations within the United States. The principal operations include stripping, dipping, coating (painting, etc.), electroplating, anodizing, and etching (printed circuits, chemical milling, etc.). While waste volumes are not normally large compared to the steel, paper, food processing, or petroleum industries, their frequently corrosive and highly toxic nature makes these wastes particularly hazardous.

Waste treatment, usually by chemical processes, is necessary to protect sewer lines from corrosion, sewer maintenance crews from toxic gases and minerals, and receiving municipal biological treatment plants from deactivation by slugs or accumulations of toxic materials, and to protect all species that may come into contact with the receiving waters.

The steel industry and metal finishing (other than electroplating) programs are implemented by Dr. Hugh B. Durham, Chief, Industrial Waste Research Program, EPA, Grosse Ile, Michigan, 48138; (313) 675-5000. The nonferrous and electroplating program are implemented by Mr. John Ciancia, Chief, Industrial Waste Technology Branch, EWRD, EPA, Edison, New Jersey, 08817; (201) 548-3347 Ext. 410.

## PROJECT INDEX

## PPB 12010 - METAL AND METAL PRODUCTS

| 12010 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| DIM | University of Utah | A | 2-9 |
| DHP | Clarkson College of Technology | D | 2-10 |
| DOT | University of Waterloo | B | 2-11 |
| FPK | Battelle Memorial Institute | B | 2-12 |
| FXD | Metal Finishers' Foundation | C | 2-13 |
| DRH | Minnesota Pollution Control Agency | A | 2-14 |
| DUL | Armco Steel Corporation | A | 2-15 |
| EZV | Armco Steel Corporation | A | 2-16 |
| WPRD 41 | Chemical Separations Corporation | B | 2-17 |
| EIE | Metal Finishers' Foundation | A | 2-18 |
| DMF | The Beaton and Corbin Manufacturing Company | B | 2-19 |
| DPF | Volco Brass and Copper Company | A | 2-20 |
| DSA | S.K. Williams Company | B | 2-21 |
| DFS | RAI Research Corporation | B | 2-22 |
| DRE | Interlake Steel Corporation | B | 2-23 |
| DNF | CF&I Steel Corporation | B | 2-24 |
| EDY | American Iron and Steel Institute | B | 2-25 |
| DTQ | Weirton Steel Corporation | A | 2-26 |
| EQF | Alabama Water Improvement Commission | A | 2-27 |
| FNM | The Fitzsimons Steel Company, Inc. | B | 2-28 |
| GCS | Aerodex, Inc. | C | 2-29 |
| GVV | Michigan Plating and Stamping Company | C | 2-30 |

| 12010 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| GUG | New England Plating Company, Inc. | C | 2-31 |
| HOW | Alan Wood Steel Company | C | 2-32 |
| HQJ | American Electroplaters Society, Inc. | C | 2-33 |
| 800625 | Attorney General of Illinois | C | 2-34 |
| 801349 | The New Jersey Zinc Company | C | 2-35 |

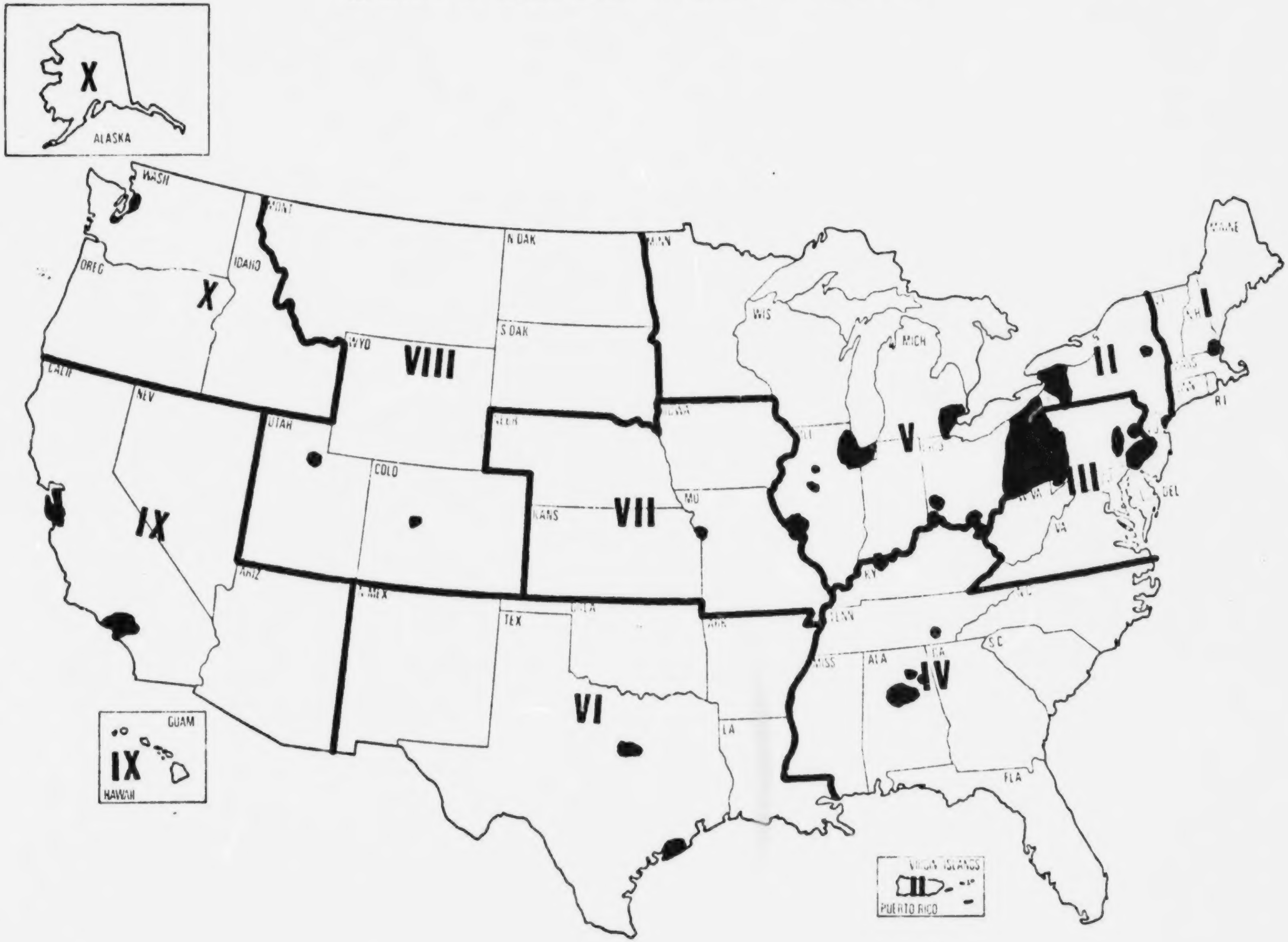
*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

FINAL REPORTS AVAILABLE

PPB 12010 - METAL AND METAL PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12010 EIE 11/68 | A State-of-the-Art Review of Metal Finishing Waste Treatment, Battelle Memorial Institute, Columbus, Ohio. | GPO - $1.00 |
| 12010 EIE 03/71 | An Investigation of Techniques for Removal of Chromimum from Electroplating Wastes, Battelle Memorial Institute, Columbus, Ohio. | GPO - $1.00 |
| 12010 EZV 02/70 | Treatment of Waste Water - Waste Oil Mixtures, Armco Steel Corporation, Middletown, Ohio. | GPO - $2.50 |
| 12010 DIM 08/70 | Pyrite Depression by Reduction of Solution Oxidation Potential, University of Utah, Salt Lake City, Utah. | GPO - $0.70 |
| 12010 DUL 02/71 | Limestone Treatment of Rinse Waters from Hydrochloric Acid Pickling of Steel, Armco Steel Corporation, Middletown, Ohio. | GPO - $1.50 |
| 12010 EQF 03/71 | An Electromembrane Process for Regenerating Acid from Spent Pickle Liquor, Southern Research Institute, Birmingham, Alabama. | GPO - $1.00 |
| 12010 EIE 11/71 | An Investigation of Techniques for Removal of Cyanide from Electroplating Wastes; by Battelle Columbus Labs., Columbus, Ohio | GPO - $1.00 |
| 12010 DRH 11/71 | Ultrathin Membranes for Treating Metal Finishing Effluents by Reverse Osmosis; by North Star Research & Development Insti. (through Minnesota Pollution Control Agency), Minneapolis, Minn. | GPO - $1.00 |
| 12010 DTQ 02/72 | Combined Steel Mill and Municipal Wastewaters Treatment, Weirton Steel Div., National Steel Corporation, Weirton, West Virginia | GPO - $1.50 |
| 12010 DPF 11/71 | Brass Wire Mill Process Changes and Waste Abatement, Recovery and Reuse, Volco Brass and Copper Company, Kenilworth, New Jersey | GPO - $0.55 |
| 12010 DMF 08/72 | Chemical Treatment of Plating Waste for Removal of Heavy Metals, The Beaton & Corbin Manufacturing Co., Southington, Connecticut | |

LOCATION OF MAJOR BLAST FURNACES AND STEEL MILLS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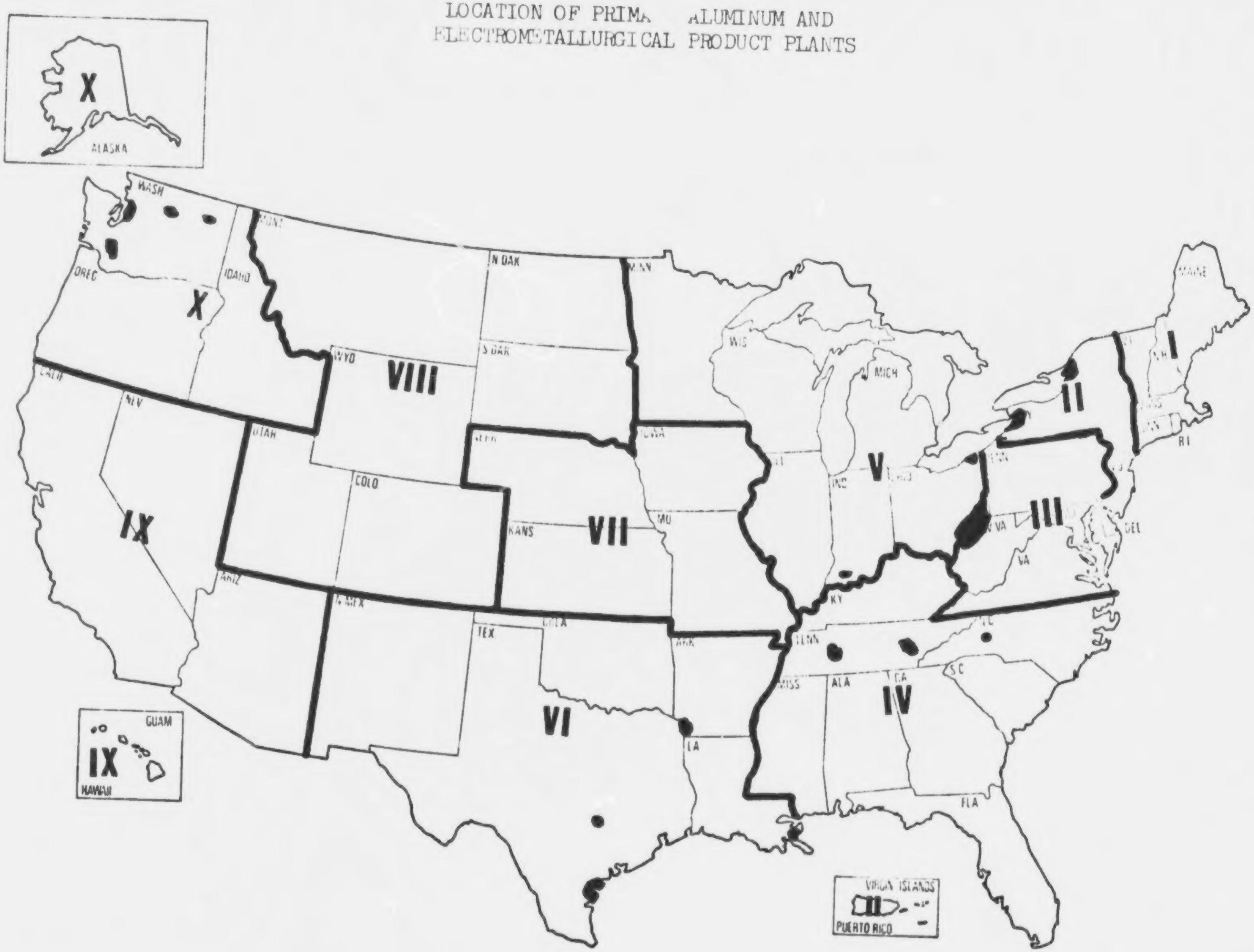
LOCATION OF PRIMA ALUMINUM AND
ELECTROMETALLURGICAL PRODUCT PLANTS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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DIM

TITLE OF PROJECT: Pyrite Depression by Reduction of Solution Oxidation Potential

GRANTEE OR CONTRACTOR:
Department of Mineral Engineering
University of Utah
Salt Lake City, Utah

EPA PROJECT OFFICER:
James V. Rouse
Division of Field Investigations -
Denver Center, EPA
Denver Federal Center, Bldg. 22
Denver, Colorado 80225

Project Site: Salt Lake City, Utah

DESCRIPTION OF PROJECT

Award Date: January 1, 1969 Project Cost: $13,559

Completion Date: July 1, 1970 Federal Cost: $12,663

Summary:

In this study of pyrite depression by reducing agents with potassium ethylxanthate as collector, it has been shown that pyrite may be depressed effectively in the flotation of both lead and copper sulfide ores without the use of poisonous cyanide salts. More specifically, the use of sodium sulfite as the depressant may result in metallurgical, economical, environmental, and safety advantages over the use of cyanide, a poison. For example, in the case of the copper ore, the best results with cyanide as the depressant were a rougher concentrate recovery of 90.2 per cent and a grade of 4.3 per cent Cu. However, when sulfite was used as the depressant for the same recovery a grade of 7.3 per cent Cu was obtained.

Experimental results support the theory that dixanthogen is the collector species responsible for pyrite flotation. The study shows that pyrite depression is possible by maintaining a reduced solution oxidation potential thus preventing dixanthogen formation. Depression was effected with the following reducing agents: sulfite, sulfide, thiosulfate, hypophosphite, and oxalate. In all cases the results were similar. The proposed mechanism of depression involves the adsorption of the reductant on surface active sites, thus preventing the adsorption and dissociation of molecular oxygen to nascent oxygen.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DHP

TITLE OF PROJECT: Metal Removal/Recovery from Polluted Water by Complexation with Linear Polyelectrolytes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Chemistry | Clifford Risley |
| Clarkson College of Technology | Region V, EPA |
| Potsdam, New York 13676 | 1 North Wacker Drive |
| | Chicago, Illinois 60606 |

Project Site: Potsdam, New York

DESCRIPTION OF PROJECT

Award Date: March 1, 1970 Project Cost: $30,780 (2nd year)

Completion Date: March 1, 1971 Federal Cost: $27,086 (2nd year)

Summary:

Polygalacturonic acid as received from the manufacturer and in purified form has been investigated in detail as a complexing agent for heavy metal ions (in particular, $Cu^{++}$, $Cd^{++}$, $Zn^{++}$ and $Ni^{++}$), especially for rinse waters of the electroplating and mining industries. This natural acid was found to be an efficient complexing agent for metal cations; the latter can be recovered from the complexes by leaching with 1.5 N HCl. The remaining polymer can be recycled with very little loss (ca. 3 per cent) for further complexation. The decisive discovery was made that the complex-precipitates have very small volumes if polygalacturonic acid is added in powder form. The consequence is that only small volumes of 1.5 N HCl are needed for leaching and that the ratios of the concentrations of recovered metal ions in the final solutions to those in the original solutions range from several hundred to several thousand. The concentrations of ions left in the original solutions are near the limits for potable water except in the case of nickel.

Polygalacturonic acid in conjunction with a polybase also precipitates complexes of metals present in solution in anionic form. It may also be feasible to treat cyanide wastes by this method, and possibly Cd and Zn can be separated from Cu and Ni in this way. The polyacid also removes heavy metal ions from concentrated, strongly acidified chromic acid solution.

From an economical point of view it may be advantageous to work with pectin, the raw material of polygalacturonic acid, in spite of the fact that about 20 - 30 per cent more of pectin than polygalacturonic acid is needed to achieve the same amount of complexation.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DOT

TITLE OF PROJECT: Detoxication of Cyanide Wastes by Electroxidation

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Chemical Engineering<br>University of Waterloo<br>Waterloo, Ontario, Canada | Clifford Risley<br>Region V, EPA<br>1 North Wacker Drive<br>Chicago, Illinois 60606 |

Project Site: Waterloo, Ontario, Canada

DESCRIPTION OF PROJECT

Award Date: May 1, 1970 Project Cost: $10,600 (2nd year)

Completion Date: October 31, 1971 Federal Cost: $10,065 (2nd year)

Summary:

This grant provides for a continuation of the investigation of the fundamentals of the electroxidation of cyanide in plating-room rinse waters and for the development, design, construction, and test operation of a 2-gpm demonstration unit on simulated cyanide wastes; on typical copper, cadmium, and brass cyanide plating rinse waters (40-150 ppm total cyanide); and on mixed plating-room effluents also containing hexavalent chromium, nickel, and sulfates.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Contract , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 FPK

TITLE OF PROJECT: A Review of Water Pollution Control Practices and Problems in the Nonferrous Metals Industries

GRANTEE OR CONTRACTOR:
Battelle Memorial Institute
505 King Avenue
Columbus, Ohio 43201

EPA PROJECT OFFICER:
John Ciancia, Chief
Industrial Waste Technology Branch
Edison Water Research Division, EPA
Edison, NJ 08817

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 25, 1970 | Project Cost: | $72,500 |
| Completion Date: | June 25, 1971 | Federal Cost: | $68,060 |

Summary:

Baseline data on water pollution problems and R&D needs related to domestic mining, ore concentration and reduction, and metal extraction operations in the nonferrous metals industries will be obtained. The industries to be studied will be grouped as follows: (a) copper, lead, zinc, and cadmium; (b) aluminum and magnesium; (c) nickel and cobalt; and (d) minor metals, e.g., molybdenum, beryllium, manganese, etc.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 FXD

TITLE OF PROJECT: Reclamation of Metal Values from Metal Finishing Waste Treatment Sludges

GRANTEE OR CONTRACTOR:
Metal Finishers' Foundation
248 Lorraine Avenue
Upper Montclair, New Jersey
07043

EPA PROJECT OFFICER:
Eugene Harris
National Environmental Research Center, EPA
Cincinnati, Ohio 45268

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: October 6, 1970

Project Cost: $99,970

Completion Date: October 6, 1972

Federal Cost: $90,069

Summary:

The Metal Finishers' Foundation will, by means of a contract with Battelle Memorial Institute, Columbus Laboratories, conduct a study and "in-plant" bench-scale evaluation of techniques for recovering metals from sludges produced in the treatment of spent operating baths and rinse waters from metal finishing operations.

This project will develop information on sludge volumes and characteristics relative to work loads and type of operation, the effects of weathering on sludges in current disposal practice, the techniques for metals recovery, and the economics of these operations.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DRH

TITLE OF PROJECT: Use of Reverse Osmosis for Treating Metal Finishing Effluents

GRANTEE OR CONTRACTOR:
Minnesota Pollution Control Agency
717 Delaware St., S.E.
Minneapolis, Minnesota 55440

EPA PROJECT OFFICER:
Dr. Hugh B. Durham
Industrial Waste Research Program
Environmental Protection Agency
Grosse Ile, MI 48138

Project Site: Minneapolis, Minnesota

DESCRIPTION OF PROJECT

Award Date: May 1, 1971

Completion Date: April 30, 1972

Project Cost: $106,100 (2nd year)

Federal Cost: $75,860 (2nd year)

Summary:

The Minnesota Pollution Control Agency proposes to engage North Star Research and Development Institute (3100 Thirty-Eighth Avenue, S.E., Minneapolis, Minnesota 54406) to conduct Phase II of an anticipated three-phase,three-year project. The objectives of the project are to develop reverse osmosis (RO) for the treatment of metal finishing effluents (MFE) for the purposes of elimination of pollutants from effluents, recovery of valuable plating materials, and recovery of wastewaters for reuse.

In Phase I candidate membranes were screened for the following characteristics: high flux rates, high percent rejection, and resistance to hydrolysis and oxidation.

Phase II will consist of selecting the most promising membrane of Phase I and carrying out reverse osmosis tests of the membrane in commercial modules for optimum design considerations leading to an anticipated Phase III closed-loop, in-plant demonstration facility.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DUL

TITLE OF PROJECT: Limestone Treatment of Rinse Waters from Hydrochloric Acid Pickling of Steel

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Armco Steel Corporation<br>Middletown, Ohio | Edw. L. Dulaney<br>Industrial Pollution Control Section, ORM<br>Environmental Protection Agency<br>Washington, D.C. 20460 |

Project Site: Middletown, Ohio

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | November 1, 1967 | Project Cost: | $1,784,800 |
| Completion Date: | November 1, 1970 | Federal Cost: | $547,500 |

Summary:

Two hydrochloric acid picklers for cleaning steel strip at Armco Steel Corporation's Middletown, Ohio Works produce up to 1,500 gpm of acid rinse waters which contain up to 0.5 g/l free hydrochloric acid and up to 0.87 g/l ferrous chloride. A facility for disposal of these rinse waters was designed, based on a process developed at bench-scale by Armco research scientists. This process utilizes limestone for neutralization plus aeration and sludge recirculation to oxidize ferrous iron and form soluble calcium chloride. The final report on this project describes the investigation of process variables at pilot-scale and the optimization and demonstration of the process at full-scale.

The full-scale facility provided 100 percent neutralization of free acid and over 99 percent removal of iron using a 50 percent excess of limestone. A very dense, easily filtered sludge was produced. Although influent temperatures as low as 59°F were encountered, game fish populations were maintained in the treated water. Capital costs for a facility to treat 1,500 gpm acid rinse water were $1,360,000. Operating costs were 24.0¢/1,000 gal. or 4.38¢/ton of steel pickled.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 EZV

TITLE OF PROJECT: Treatment of Wastewater - Waste Oil Mixtures .

GRANTEE OR CONTRACTOR:
Armco Steel Corporation
Middletown, Ohio

EPA PROJECT OFFICER:
Edw. L. Dulaney
Industrial Pollution Control Section, ORM
Environmental Protection Agency
Washington, D.C. 20460

Project Site: Ashland, Kentucky

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | November 1, 1967 | Project Cost: | $1,541,720 |
| Completion Date: | June 1, 1970 | Federal Cost: | $209,000 |

Summary:

Cold reduction of steel strip results in the production of large quantities of wastewater containing variable amounts of oil. A five-stand tandem cold mill located at Armco Steel Corporation's Ashland, Kentucky Works produces 200 to 500 gpm of wastewater containing 400 to 4,000 ppm of oil. The COD of the waste varies from 400 to 20,000 ppm.

A treatment process and facility was developed, constructed, and demonstrated, on full scale, for the treatment of cold mill wastes. The treatment process utilized chemical coagulation to break the emulsions. The chemicals employed included alum, lime, clay, and organic polyelectrolyte. The process consisted of the following treatment steps: equalization, chemical addition and rapid mixing, flocculation, and dissolved air flotation. A number of treatment variables were studied in the laboratory and in the field in order to establish process kinetics and optimum treatment efficiency.

Oil, COD, and turbidity were used in field studies to establish the effect of the following variables on treatment efficiency: chemical concentration, order of chemical addition, chemical mixing time, flocculation mixing time and speed, and air flotation time and recirculation rate. Based on these studies, design criteria and operating costs for this process were presented.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPRD 41(R1)-01-68

TITLE OF PROJECT: Acid Pickle Liquor Wastes Treatment Utilizing Advanced Ion Exchange Techniques

GRANTEE OR CONTRACTOR:
Chemical Separations Corporation
Bus Terminal Road
Oak Ridge, Tennessee 37830

EPA PROJECT OFFICER:
Dr. Hugh B. Durham
Industrial Waste Research Program
Environmental Protection Agency
Grosse Ile, Michigan 48138

Project Site: Oak Ridge, Tennessee

DESCRIPTION OF PROJECT

Award Date: December 20, 1967

Project Cost: $72,000

Completion Date: March 19, 1969

Federal Cost: $50,400

Summary:

The purpose of this grant is to determine the feasibility of using continuous ion exchange to strip Fe from pickling wastes and regenerate the acid for reuse. The iron will be converted to a high grade $Fe_2O_3$ for use in metallurgical processing as by-product.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 EIE

TITLE OF PROJECT: An Investigation of Techniques for the Removal of Chromium and Cyanides from Electroplating Wastes

GRANTEE OR CONTRACTOR:
Metal Finishers' Foundation
Upper Montclair, New Jersey

EPA PROJECT OFFICER:
John Ciancia, Chief
Industrial Waste Technology Branch
Edison Water Research Division, EPA
Edison, New Jersey 08817

Project Site: Battelle Memorial Institute
Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: March 1, 1968

Project Cost: $173,141

Completion Date: April 1, 1971

Federal Cost: $117,699

Summary:

Report 12010 EIE 11/68 discusses information in the open literature pertaining to waste treatment in the metal finishing industry. The survey emphasizes the nature of electroplating wastes; their impact on sewers, sewage treatment plants, and natural water bodies; current restrictions on their disposal; and conventional methods available for treatment of these wastes.

Report 12010 EIE 03/71 describes work which was conducted on the removal of hexavalent chromium from plating rinse waters employing various treatment processes. The study consisted of an initial phase in which information was sought by questionnaire and by wastewater analyses on the type of waste produced by smaller electroplating plants. Laboratory studies were conducted on several nonconventional methods for treatment of these wastewaters including ion flotation, adsorption on activated carbon, and solvent extraction. A demonstration pilot-plant study also was conducted on the activated carbon process employing actual rinse waters from a hard chrome plating operation.

The results of the various phases of the study indicated that activated carbon adsorption for chromium removal may have practical application in many small plating plants. Further development of the process was recommended in actual plating plant installations.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DMF

TITLE OF PROJECT: Chemical Treatment of Plating Waste for Elimination of Chromium, Nickel and Metal Ions

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>The Beaton and Corbin Mfg. Co.<br>Southington, Connecticut | EPA PROJECT OFFICER:<br>John Ciancia, Chief<br>Industrial Waste Technology Branch<br>Edison Water Research Division, EPA<br>Edison, New Jersey 08817 |

Project Site: Southington, Connecticut

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 3, 1968 | Project Cost: | $58,220 |
| Completion Date: | April 3, 1971 | Federal Cost: | $37,250 |

Summary:

Chemical rinses for electroplating dragout contamination and batch chemical treatment for spent processing solution are demonstrated as a practical method of removal of chromium, nickel, zinc and copper ions to a level where substantial quantities of water may be reused.

The toxic metal ions are precipitated by chemical means in an easily settled sludge and subsequently further compacted in simple outdoor earthen sludge beds for ultimate disposal as landfill.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DPF

TITLE OF PROJECT: Treatment Recovery, and Reuse of Copper Wire Mill Pickling Wastes

GRANTEE OR CONTRACTOR:
Volco Brass and Copper Co.
Kenilworth, New Jersey 07033

EPA PROJECT OFFICER:
John Ciancia, Chief
Industrial Waste Technology Branch
Edison Water Research Division, EPA
Edison, New Jersey 08817

Project Site: Kenilworth, New Jersey

DESCRIPTION OF PROJECT

Award Date: June 28, 1968
Project Cost: $177,159

Completion Date: December 31, 1970
Federal Cost: $124,000

Summary:

The final report to the project describes process changes and waste treatment, recovery, and reuse facilities installed by Volco Brass and Copper Company, located in Kenilworth, New Jersey. The plant produces 75 tons of wire per day.

An electrolytic system was installed to recover copper from the spent primary pickle solution and to regenerate the sulfuric acid for reuse. A hydrogen peroxide bright pickle replaced the chromate and fluoride bright pickles previously used. Copper from the bright pickle is also recovered in the electrolytic system. The electrolytic copper is reused on location in casting. An integrated copper treatment system was installed to treat bright pickle drag-out. Sludge from the integrated system is recovered for sale. Rinse water consuption was reduced from 150 gpm to 10 gpm. Former discharges of chromium, ammonium, and fluoride ions have been eliminated. Cost and operating data and effluent analyses are presented.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DSA

TITLE OF PROJECT: Electroplating Waste Treatment and Water Reuse

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| S. K. Williams Company<br>2370 N. 32nd Street<br>Milwaukee, Wisconsin 53210 | Clifford Risley<br>Region V, EPA<br>1 North Wacker Drive<br>Chicago, Illinois 60606 |

Project Site: Milwaukee, Wisconsin

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 17, 1968 | Project Cost: $157,306.80 |
| Completion Date: May 16, 1971 | Federal Cost: $87,750.00 |

Summary:

The S. K. Williams Company has installed a complete waste treatment system to make the wastewater effluent suitable for discharge. Included in the new plant are most of the metal finishing processes common to the industry. Despite the wide range of toxic materials used in these processes and the severely limited availability of water at the new plant, the company is now able to discharge an effluent exceeding the quality established by the USPHS for drinking water supplies.

Five integrated waste treatment systems, each designed for a specific type of waste compound, are used to protect the rinse waters from contamination by process solution dragout. A batch-type treatment system handles miscellaneous and intermittent discharges. The entire design aims for a minimum volume of sludge production, and a unique and economical sludge dewatering technique is included. Improved rinsing efficiency is achieved through the use of integrated chemical rinses, thus permitting the plant to operate on a minimum water supply. Chemical reaction efficiency was considered in the design of each phase of the treatment system to insure reduced chemical consumption and maximum economy of operation. Data listing the operating and capital costs for the entire system is presented in the final report for the project. Operating experiences are also described in the final report.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12010 DFS

TITLE OF PROJECT: Treatment of Cyanide Rinse Waters by Electrodialysis

GRANTEE OR CONTRACTOR:
RAI Research Corp.
36-40 37th Street
Long Island City, New York 11101

EPA PROJECT OFFICER:
Lloyd Kahn
Edison Water Research Division
Edison, New Jersey 08817

Project Site: Long Island City, New York

DESCRIPTION OF PROJECT

Award Date: November 11, 1968 Project Cost: $83,835

Completion Date: December 31, 1969 Federal Cost: $58,685

Summary:

In a typical metal plating operation, electroplated work is removed from the plating bath and rinsed. The rinsewater discharged from the operation contains components of the plating bath. When cyanide baths are used the waste is highly deleterious and toxic.

A system is developed in this study whereby the discharge of rinsewater is eliminated. The work, according to this method, is rinsed in a sequence of two rinses; the final rinse contains a concentration of cyanide of 1/10,000 of that of the plating bath.

These concentrations are maintained by the use of electrodialysis to transport cyanides from the second rinse solution to the first rinse solution and also from the first rinse to the plating bath. In this way, all cyanide is recovered and returned to the bath. Design parameters are determined from the experiments of this study and costs are estimated.

The experimental system used in this study was a prototype of a commercial-size electrodialysis unit operated continuously under conditions which simulated those of the projected two-stage commercial system using a cyanide copper plating bath.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DRE

TITLE OF PROJECT: Pollution Control of Blast-Furnace Gas Washer Through Recirculation

GRANTEE OR CONTRACTOR:
Interlake Steel Corporation
310 South Michigan Avenue
Chicago, Illinois 60604

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: January 29, 1969 Project Cost: $525,600

Completion Date: January 31, 1971 Federal Cost: $175,200

Summary:

The full-scale demonstration project will provide additional facilities for the treatment and reuse of 7.2 mgd of blast-furnace gas washer water from the venturies and coolers on two blast furnaces. The water before treatment contains 700 ppm of suspended solids, 1630 ppm of total solids, 3 ppm cyanides, and 100 ppb of phenols. An anionic polyelectrolyte will be used to improve recovery of magnetite ($Fe_3O_4$) and removal of cyanides in the primary clarifier. In addition, polyphosphates and chlorine will be used as required to prevent a hydrogen cyanide hazard in the vacinity of the cooling tower. A new cooling tower will reduce the water temperature and further reduce cyanides thus permitting reuse of most of the water. The cooling tower blowdown will be used to cool slag. The blowdown stream will be evaporated and leave its dissolved solids on the slag pile. The blowdown rate will be determined by the allowable alkalinity of the recirculated water. The water is passed through cooling coils in the walls of the blast furnaces before routing through the venturies. This is expected to limit the alkalinity to 500 ppm.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12010 DNF

TITLE OF PROJECT: Research Study of Coal Preparation Plant and By-Product Coke Plant Effluents

GRANTEE OR CONTRACTOR:
CF&I Steel Corporation
P.O. Box 1920
Denver, Colorado 80201

EPA PROJECT OFFICER:
Fred Pfeffer
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Pueblo, Colorado

DESCRIPTION OF PROJECT

Award Date: March 27, 1969

Completion Date: August 1, 1970

Project Cost: $205,000

Federal Cost: $86,500

Summary:

This project will provide for: (a) a study of waste sources, volumes, and characteristics; (b) laboratory and bench-scale studies of alternate treatment processes; and (c) a study of additions to planned coal washery filtration facilities to develop reuse possibilities of non-coking solids and solids waste disposal. Development of methods for wastewater treatment to produce effluents suitable for reuse or discharge in accordance with state stream standards will be a major objective.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 EDY

TITLE OF PROJECT: Biological Removal of Carbon and Nitrogen Compounds from Coke Plant Wastes

GRANTEE OR CONTRACTOR:
American Iron & Steel Institute
150 East 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:
Leon Myers
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Houston, Texas

DESCRIPTION OF PROJECT

Award Date: June 25, 1969

Project Cost: $156,000

Completion Date: March 25, 1971

Federal Cost: $109,200

Summary:

The Armco Steel Corporation, under the sponsorship of the AISI and with the assistance of the AISI Fellowship at Mellon Institute, will design, construct, operate, optimize, and evaluate a 1-gpm pilot facility for the three-stage biological treatment of raw ammoniacal liquors from the by-product coke plant of Armco Steel located at Houston, Texas. A typical analysis of this waste would indicate 1240 ppm of phenol, 60 ppm cyanide, and 6400 ppm ammonia. The three-stage biological treatment system is designed to accomplish:

1. Oxidation of carbonaceous material (aerobic)
2. Nitrification of nitrogenons compounds (aerobic)
3. Nitrate reduction to nitrogen gas (anaerobic).

Laboratory testing indicates that removal of 75 per cent of organic carbon, 99 per cent of phenol and cyanide, and essentially all of the ammonia can be expected. The pilot facility will provide the basis for the design of a full-scale facility.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 DTQ

TITLE OF PROJECT: Combined Steel Mill and Municipal Wastewaters Treatment

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Weirton Steel Division | Wm. L. West |
| National Steel Corporation | Wheeling Field Station, EPA |
| Box 431 | 11th & Chapline St. |
| Weirton, West Virginia 26062 | Wheeling, West Virginia 26063 |

Project Site: Weirton, West Virginia

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | July 30, 1969 | Project Cost: | $163,963 |
| Completion Date: | January 29, 1971 | Federal Cost: | $95,918 |

Summary:

A systems evaluation was made to determine the feasibility and economics of treating selected steel mill and sanitary wastewaters in a municipal sewage treatment plant. The project was Phase I of a three-phase program to demonstrate that industry and municipalities through cooperative action can combine their wastewaters and attain their individual treatment goals in an efficient and economical manner.

Detailed field work was carried out at the steel plant and the total sewage plant treatment system. Selected steel plant wastes were combined with municipal wastes and evaluated in both batch and continuous treatability bench-scale studies.

The investigation revealed that it is technically and economically feasible to co-treat selected steel plant wastes with municipal wastewaters. A demonstration plant would further develop the specific operating procedures such as sludge concentration control, pH control, and rates of waste additions so that the process scheme could be routinely implemented in similar situations.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 EQF

TITLE OF PROJECT: Electromembrane Process for Regenerating Acid from Spent Pickle Liquor

GRANTEE OR CONTRACTOR:
Alabama Water Improvement Commission
State Office Building
Montgomery, Alabama 36104

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Southern Research Institute
Birmingham, Alabama

DESCRIPTION OF PROJECT

Award Date: September 9, 1969 Project Cost: $32,000

Completion Date: November 1, 1970 Federal Cost: $20,000

Summary:

Studies of an electromembrane process for regenerating acid from spent sulfuric acid pickle liquor have indicated that the process is technically feasible. The studies have shown that the iron ions in spent pickle liquor can be removed and replaced by hydrogen ions to regenerate $H_2SO_4$ in electromembrane cells.

A method of removing iron from spent liquor that involves the formation of insoluble iron hydroxides is preferable to plating iron metal onto cathodes.

Estimated treatment costs were $0.045 ± 0.002 per gallon, whereas the combined costs of purchasing acid and disposing of spent liquor by existing methods were in the range of $0.015 to $0.06 per gallon of spent liquor.

A determination of the long-term performance of the ion exchange membranes when treating actual pickle liquors that contain organic pickling aids is needed.

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 FNM

TITLE OF PROJECT: Recovery of Sulfuric Acid and Ferrous Sulfate From Waste Pickle Liquor

GRANTEE OR CONTRACTOR:
The Fitzsimons Steel Co., Inc.
P.O. Box 1469
1623 Wilson Ave.
Youngstown, Ohio 44501

EPA PROJECT OFFICER:
James H. Phillips
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Youngstown, Ohio

DESCRIPTION OF PROJECT

Award Date: May 1, 1970
Project Cost: $143,998.00

Completion Date: November 30, 1971
Federal Cost: $39,056.50

Summary:

This grant provides for the engineering plans, installation, operation, testing, evaluation, and reporting on a full-scale facility for the elimination of 55,000 gallons per month of spent sulfuric acid pickle liquor discharge. A vacuum cooling-crystallization system will remove ferrous sulfate and concentrate the remaining acid solution for recycle to the pickling tanks. Processes for recycle or treatment of the acid rinse waters and for conversion of ferrous sulfate to other more marketable products will be evaluated. John N. Cernica and Associates, Consulting Engineers, will direct the studies and evaluations and prepare reports.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 GCS

TITLE OF PROJECT: Destruction of Cyanide Wastes by an Electrochemical Redox Process

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Aerodex, Inc.<br>P.O. Box 123 MIAD<br>Miami, Florida 33148 | Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street, N.E.<br>Atlanta, Georgia 30309 |

Project Site: Miami, Florida

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: February 1, 1971 | Project Cost: $183,841 |
| Completion Date: July 31, 1973 | Federal Cost: $85,072 |

Summary:

This project is planned to culminate in a full-scale (250 gpm) demonstration facility for the electrochemical destruction of cyanide in wastes from electroplating operations. Phase I provides for optimization of parameters in a 600-gallon batch system. Phase II will consist of the design of a continuous system based on the data and conclusions from Phase I. Phase III will consist of construction, operation, testing, evaluation, and reporting on the effectiveness and economics of the continuous flow demonstration facility.

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 GVV

TITLE OF PROJECT: Recovery of Chromic Acid and Nickel From Plating Wastes

GRANTEE OR CONTRACTOR:
Michigan Plating & Stamping Co.
740 Ann Avenue, N.W.
Grand Rapids, Michigan 49502

EPA PROJECT OFFICER:
Dr. Hugh B. Durham
Industrial Waste Research Program
Environmental Protection Agency
Grosse Ile, Michigan 48138

Project Site: Grand Rapids, Michigan

DESCRIPTION OF PROJECT

Award Date: March 1, 1971 Project Cost: $1,038,198

Completion Date: November 30, 1972 Federal Cost: $170,061

Summary:

This bumper plating plant is installing integrated waste treatment systems to treat nickel and chromium plating bath dragout. This grant provides for the installation, operation, testing, evaluation, and reporting on the heavy metals recovery and water reuse systems to be installed. The electrolytic nickel recovery system is expected to recover 250 pounds of nickel per day from the integrated treatment system sludges and plating bath purification system carbons. The chromate system is expected to recover 350 pounds of chromic acid per day by the continuous flow of concentrated rinse waters from a save-rinse tank through an induced draft evaporative tower. Chromium dragout from the save-rinse tank will be reduced and precipitated in the integrated chrome treatment system. This combination system allows appreciable acid recovery, sufficient acid dragout to maintain plating bath purity, and a very low chromium concentration in the plant effluent. The evaporative tower will also receive, concentrate, and recover acid from the chrome-plating line fume scrubbing system waters. The installation is expected to demonstrate the capability of the tower to simultaneously serve as a fume scrubber and as an acid concentrating and recovering system.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 GUG

TITLE OF PROJECT: Electrolytic Treatment of Job Shop Metal Finishing Wastewaters

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| New England Plating Co., Inc.<br>31 Garden Street<br>Worcester, Massachusetts 01605 | John Ciancia, Chief<br>Industrial Waste Technology Branch<br>Edison Water Research Division<br>Edison, New Jersey 08817 |

Project Site: Worcester, Massachusetts

DESCRIPTION OF PROJECT

Award Date: April 1, 1971 Project Cost: $392,252

Completion Date: December 31, 1972 Federal Cost: $119,424

Summary:

The New England Plating Company is installing three new type graphite bed electrolytic cells to treat 30 gpm of cyanide-bearing rinse waters and four cells to treat 40 gpm of chromate bearing rinse waters. The cells will also be used for batch treatment of concentrated wastes from spent plating bath dumps. Back-up chemical treatment systems will assure complete waste treatment. This will permit direct comparison of treatment costs between the electrolytic and the chemical methods. These cells, which utilize novel semi-conductive beds to maintain current flow in dilute solutions, are expected to reduce or eliminate chemical waste treatment costs. Secondary uses of untreated waters and reuse of treated waters are expected to reduce waste volumes by 50 per cent.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 HOW

TITLE OF PROJECT: "Treatment of Coke Plant Waste Liquor"

GRANTEE OR CONTRACTOR:
Alan Wood Steel Company
Conshohocken, Pa. 19428

EPA PROJECT OFFICER:
Dr. Hugh B. Durham
Industrial Waste Research Program
Environmental Protection Agency
Grosse Ile, Michigan 48138

Project Site: Conshohocken, Pa.

DESCRIPTION OF PROJECT

Award Date: December 15, 1971 Project Cost: $2,105,050

Completion Date: September 15, 1973 Federal Cost: $ 352,652

Summary:
This project will demonstrate, in a full-scale (180,000 gpd) system, complete treatment of by-product coke plant wastes. The treatment consists of steam stripping of ammonia and phenol, multi-stage flash evaporation, and polishing the condensed effluent with activated carbon. The treated effluent will be a high quality water which can be used for boiler feedwater or cooling water make-up. An incinerator will receive all the vapors and the final concentrate from the evaporator system, producing a scrubbed gas suitable for discharge to the atmosphere and an ash to be disposed of by landfill.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12010 HQJ

TITLE OF PROJECT: Membrane Processes for Treating Metal Finishing Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| American Electroplaters' Society Inc.<br>56 Melmore Gardens<br>East Orange, New Jersey 07017 | John Ciancia, Chief<br>Industrial Waste Technology Branch<br>Edison Water Research Division, EPA<br>Edison, New Jersey 08817 |

Project Site: Cambridge, Massachusetts

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | October 15, 1971 | Project Cost: | $120,406 |
| Completion Date: | January 15, 1973 | Federal Cost: | $114,386 |

Summary:

Reverse osmosis and ultrafiltration are new approaches that show promise as attractive alternatives to existing methods for treating metal finishing wastes. The overall objective of this project is to develop and then demonstrate a reverse osmosis/ultrafiltration system on a pilot plant scale in a metal finishing plant. The study will evaluate the technical feasibility and economics of the new process for treating rinse water from a metal finishing operation by recovery of the chemicals in a concentrated solution for return to the bath while simultaneously purifying the water for reuse in rinsing. Where necessary, the investigation will also include the removal of impurity build-up in the concentrated solution returned to the bath.

The development phase of the project will involve testing commercially available membranes and equipment configurations in modular pilot plant facilities using various types of rinse waters. On the basis of this investigation, a system will be selected for treating a specific type of rinse water and will be demonstrated on a pilot plant scale in a commercial shop.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: R-800625

TITLE OF PROJECT: Water Pollution Control Practices in the Carbon and Alloy Steel Industries

GRANTEE OR CONTRACTOR:

Attorney General of Illinois
160 N. LaSalle Street
Chicago, Illinois 60601

Project Site: Pittsburgh, PA

EPA PROJECT OFFICER:

Dr. Hugh Durham
Industrial Waste Research Program
Environmental Protection Agency
Grosse Ile, Michigan 48138

DESCRIPTION OF PROJECT

Award Date: April 1, 1972

Completion Date: Nov. 30, 1972

Project Cost: $45,000

Federal Cost: $42,750

Summary:

The objectives of this project are to refine, complete and extend the data and coverage developed by C. W. Rice Division of NUS Corporation under contract 68-01-0006 and contained in the report entitled "Industrial Profile Study on Blast Furnace and Basic Steel Products" and to prepare a similar report on the alloy steel industry.

The Attorney General of Illinois proposes to engage Datagraphics, Inc. (5100 Centre Ave., Pittsburgh, PA 15232) to carry out this project.

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6b *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S801349

TITLE OF PROJECT: The Reclamation fo Sulfuric Acid from Waste Streams

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| The New Jersey Zinc Co.<br>Palmerton, Pa. 18071 | Dr. Herbert S. Skovronek, Chief<br>Industrial Waste Technology Branch<br>Edison Water Quality Research Division<br>Edison, New Jersey 08817 |

Project Site: Palmerton, Pa.

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: | Project Cost: $262,032 |
| Completion Date: | Federal Cost: $135,843 |

Summary:

The New Jersey Zinc Company will carry out a pilot plant study of a new approach to the recovery of sulfuric acid from the waste acid stream (20% $H_2SO_4$) generated during production of titanium dioxide pigment by the sulfate process. Specifically, the study will evaluate total evaporation of the waste acid stream and subsequent reconcentration, in two stages, of the clean acid back to the 90-95% concentration necessary for reuse in the digestion process. Simplified isolation of the dissolved sulfate salts by vapor-solid rather than liquid-solid separation will be an added advantage of the total evaporation approach.

The technical and economic applicability of the total evaporation approach to spent pickle liquor from steel mills will also be evaluated.

Based on results of the pilot plant study, a full scale plant will be designed and an economic evaluation carried out for treatment of waste acid from the sulfate process.

## PPB 12020

## CHEMICALS AND ALLIED PRODUCTS

The basic objective of the wastewater treatment research program with respect to the chemicals and allied products industry is to establish the technology for new or improved pollution control methods, having industry-wide application, which will allow all necessary degrees of water pollution control to be attained. The significant wastewater sources in the chemicals and applied products field are shown in the following table, which is organized according to the Standard Industrial Classification (SIC) System and which is based on data taken from the 1967 Census of Manufacturers - Water Use in Manufacturing, a Bureau of the Census publication.

| SIC CLASS | DESCRIPTION | WASTEWATER VOLUME DISCHARGE ($10^9$ gal/yr) |
|---|---|---|
| 2818 | Industrial Organic Chemicals, n.e.c. | 2,033 |
| 282 | Plastics Materials and Synthetics | 582 |
| 2819 | Industrial Inorganic Chemicals, n.e.c. | 468 |
| 2812 | Alkalies and Chlorine | 364 |
| 289 | Miscellaneous Chemical Products | 190 |
| 2815 | Cyclic Intermediates and Crudes | 129 |
| 287 | Agricultural Chemicals | 114 |
| 283 | Drugs | 67 |
| 284 | Soap, Cleaners, and Toilet Goods | 30 |
| 2861 | Gum and Wood Chemicals | 19 |
| 2851 | Paints and Allied Products | 6 |
| 28 | Total - Chemical and Allied Products | 4,175 |

The chemical and allied products industry produces large numbers of different products and mixturos thereof. Identical products are, in many instances, made by any one of several different manufacturing processes. Also the manufacture of certain basic chemicals by non-chemically classified standard industries further compounds the problem of a clear definition of the sub-industrial classification within the industry. These dimensions of complexity do not make it readily feasible to characterize all the manufacturing establishments solely by the specific products produced or solely by the manufacturing process in use. Accordingly, the sub-industries may either be classified on the basis of a pollution problem based on the pollution problem of the major controlling pollutant in the effluent, on the general type of manufacturing operation, or by the class(es) of product(s) produced.

The difficulty of defining the sub-industries by the SIC code numbers has led to acceptance of an arbitrary division of the industry into primarily two major sections: organic chemicals and inorganic chemicals. In this method of classification, a sub-industry, as defined by the SIC code, may be considered as in either the organic or inorganic product classification depending on the specifics of the plant in question.

## The Organic Chemicals Industry

The organic chemicals industry is not readily definable in terms of the SIC numbers. Present classifications, based upon 1967 revisions, include: SIC 2815 [cyclic intermediates, dyes, organic pigments (lakes and toners), and cyclic (coal tar) crudes], SIC 2818 (organic chemicals, not elsewhere classified); portions of SIC 2813 (industrial gases); portions of SIC 2879 (agricultural chemicals, not elsewhere classified); and portions of SIC 2871 (fertilizers). On the basis of the older SIC numbers the industry included portions of SIC 2811 (fertilizers) and included SIC 2814 [cyclic (coal tar) crudes]. Organic gases are only included from SIC 2813 and ammonia and urea only from the fertilizer industry (SIC 2879 and 2871, or the revised SIC 2811).

The important products of the industry are miscellaneous cyclic and acyclic organic chemicals and chemical products, flavor and perfume materials, rubber-processing chemicals, plasticizers, pesticides, and other synthetic organic chemicals. The industry ordinarily includes production of monomers, but does not include production of polymers or plastics and synthetic fibers. Of total shipments in 1967, 75 percent were miscellaneous acyclic chemicals, a large number of which are generally designated as petrochemicals. The expansion of the petroleum industry into chemical production is of particular significance.

Total sales in the organic chemicals industry was estimated to be $11.0 billion in 1969 and is projected to be $14.3 billion in 1973. Production was estimated at 120.7 billion pounds in 1969 and will increase to 156.0 billion pounds in 1973. Growth in the industry is not expected to be uniform either among the various segments of the industry or among the various geographical areas in which the industry operates.

Organic chemicals industry pollutants originate from the incomplete removal of principal products or raw materials from reactions, in the production of non-recoverable or useless by-products, from equipment cleaning operations, and from such water uses as cooling and steam production. Wastewater generation in the industry per unit of product varies so widely that an average value has little meaning except in a statistical sense; wastewater generation varies from less than 100 gallons per ton of product to more than 100,000 gallons per ton of product. The principal contaminants in the industry's wastewaters are BOD, COD, oil, suspended solids, acidity, heavy metals, color, taste and odor-producing compounds, and residual organic products and by-products.

The production of organic chemicals results in many types of contaminated wastewaters, and the treatment methods employed cover the range of known practical techniques. In-plant control is the first step in instituting treatment practices. Such controls include the salvage of unreacted chemicals, recovery of by-products, multiple reuse of water, good housekeeping techniques to reduce leaks and spills, and changes in processing methods. These controls can result in reducing the concentrations of almost all potential pollutants and can, most importantly, reduce the volumes of wastewaters requiring treatment. Physical treatment methods such as sedimentation or flotation are used primarily to remove coarse suspended matter and floating oils and scums. Filtration is used as a form of tertiary treatment for reuse or as a pretreatment for deep-well injection. Chemical treatment is used primarily as a pretreatment prior to sedimentation, filtration, or biological treatment. Biological treatment is most widely used in the industry due to the nature of the wastes, that is, their general susceptibility to biodegradation as evidenced by relatively high BOD values.

Wastewaters from organic chemicals processing consist of contaminated and of relatively clean effluent streams. In general, the contaminated wastewaters are those which are used in direct contact with products or by-products in reactions, separation processes, vessel cleanouts, etc. The cleaner wastewaters are those used for indirect heat exchange, general washing, etc.

The sources of contaminated wastewaters from petrochemical operations are threefold. First, wastes containing a principal raw material or product arise during the stripping of the product from a solution. Incomplete removal is a fundamental requirement of any equilibrium process. However, use of more expensive or additional separation equipment may result in reduction of effluents. By-products produced during reactions constitute a second source of wastewaters. Many petrochemical reactions take place under extreme conditions where the vagaries of organic chemistry result in the production of chemicals other than those specifically desired. Often markets cannot be found for these chemicals or they cannot be reasonably recovered and are discarded to the waste stream. New production methods are directed toward increases in yields and reductions in by-products; accordingly new technology often results in a decrease in this source of waste. Spills, slab washdowns, and vessel cleanouts comprise a third category of effluents and these are generally not controllable by means of process modifications. Changes in catalyst concentrations and increases in yields, however, reduce the amount of pollutants from this source and result in some changes in the character of the waste.

Joint industrial-municipal treatment has proved to be very effective in treating organic chemical wastewaters, particularly for smaller chemical plants located near large municipal treatment systems. Treatment costs play an important role in governing the expansion of joint treatment participation. Rates established by municipalities vary extremely. Where the municipal system is small and additional contributors would overload the treatment plant, the high rates are imposed to discourage industrial contributors.

The industry has generally found that in-plant, separate treatment has economic advantages, particularly when significant quantities of contaminated wastewater are involved. No significant percentage increase is expected in the amount of organic chemical wastewaters that will be treated in joint systems in the near future. On the basis of an annual production of about 117.[illegible] billion pounds by the organic chemicals industry in 1968, municipal discharges might be expected to be about 830 gallons per ton of production for the industry as a whole.

## The Inorganic Chemicals Industry

The inorganic chemicals industry is also not easily definable in terms of the SIC numbers. However, for the inquiry it is necessary to define the industry as follows:

2812 - Alkalies and chlorine
2813 - Industrial gases (except for organic gases)
2816 - Inorganic pigments
2819 - Industrial inorganic chemicals, n.e.c.
2851 - Paints and allied products
2871 - Fertilizers (not including ammonia and urea)
2879 - Inorganic insecticides and herbicides
2892 - Explosives

The most important of the groups in terms of product value may be noted as 2819, 2812, and 2871. However, it is not sufficient to ignore such groups as 2813 which includes the important production of nitrogen and oxygen, 2851 which includes the vital surface coatings industry, or 2816 which involves inorganic pigments such as titanium oxide. The surface coatings industry is typical of the relationship which exists between segments of the inorganic industry and the organic chemical industry. The solvents and film formers which are utilized within the inorganic chemical industry for the production of surface coatings are important products of the organic chemical industry while inorganic pigments, primarily oxides and salts of titanium, iron and other metals, are products which fall into the inorganic industry category. The total product is generally defined as being part of the inorganic industry. However, it is obvious that the complex relationships which exist between various products and industries (necessary to the smooth functioning of our technological state) make it extremely difficult, if not impossible, to arbitrarily associate certain products with one SIC category.

The overall output of industrial inorganic chemicals, since they are utilized in a wide range of industries and for a wide variety of purposes usually well removed from the final consumer, depends upon the level of total economic activity rather than the economic activity in any specific segment of the economy.

Changes in consumer preferences or redistribution of income and spending, such as changes in tax levels or defense spending, may affect product mixes, but do not significantly affect total industry output. In general, price competition and product substitution are not as significant in the inorganic chemical industry as in the organic chemical sector. However, changes although slow to come tend to be quite profound.

Supplies of raw materials frequently vary and, in the case of certain materials, the industry may face serious shortages until new raw material sources (usually ores or brines) are developed. The widely fluctuating price of sulfur over the past ten years is a classic case resulting from supply fluctuations which can be matched by mercury, potash and silver, among others. Since new sources of minerals are found infrequently and usually involve relatively large expenditures to develop, wide fluctuations in the gap between demand and readily available supply are quite common in the inorganic chemical industry.

Industrial chemical industries are generally capital intensive operations (with a few exceptions such as the paint manufacturing industry) and are characterized by high productivity ($75,000 annual output per production worker), high wages, a low labor turnover, and a continuing demand for skilled labor. Most of the plants operate continuous and must operate at 75 to 85 percent of capacity to maintain adequate levels of efficiency and profitability. Smaller plants generally operate batch processes and, hence, tend to produce low-volume, high-cost, specialized chemicals.

Regional growth rates reflect a continuing trend to move production facilities closer to raw materials and markets. The industry, as a whole, is thus tending to concentrate in the Midwest and Southwest.

Wastewater from inorganic chemical processing consists both of contaminated and relatively clean effluent streams. In general, the contaminated wastewaters are those taken from processes while the cleaner wastewaters are those used for indirect heat exchange, general washing, etc. Clean waters are basically uncontaminated and can be discharged untreated. Cooling water and steam condensates are the primary sources of such water.

Contaminated wastewater from the inorganic chemical industry arises primarily from electrolysis and crystallization brines, washings from filter cakes, spent acid and alkalies, and washings from raw materials. These wastewaters are generally characterized by dissolved solids and suspended solids. In addition to contaminated waste streams, process cooling discharges occur, accounting for 40 to 80 per cent of the total discharge on the average. Treatment practices vary but involve in-plant segregation of contaminated wastes from uncontaminated cooling waters.

Many waste treatment methods are available depending on the degree of treatment required, however, equalization, neutralization, sedimentation and lagooning processes are most widely used. Biological treatment is not applicable since the contaminants are primarily dissolved or suspended inorganic materials. Plants with small discharges tend to employ only equalization and neutralization with total discharge to municipal sewer systems for joint treatment. It is estimated that between 10 and 20 percent of the process wastewater discharge from the industry is to municipal systems (7.9 per cent of the total discharge). No significant percentage changes in this regard are expected through 1974. The inorganic chemical industry has generally found that in-plant, separate treatment has economic advantages, particularly when significant quantities of wastewater are involved.

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*Project Status:
- A - Completed, Final Report Available
- B - Final Report in Preparation
- C - Work Continuing
- D - Project Terminated

## FINAL REPORTS AVAILABLE

### PPB 12020 - CHEMICALS AND ALLIED PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12020 --- 02/70 | Petrochemical Effluents Treatment Practices-Summary, Engineering-Science, Inc./Texas, Austin, Texas. | NTIS<br>PB 192 310 |
| 12020 DQC 03/71 | Polymeric Materials for Treatment and Recovery of Petrochemical Wastes, Gulf South Research Institute, New Orleans, Louisiana. | GPO - $0.70 |
| 12020 EID 03/71 | Preliminary Investigational Requirements-Petrochemical and Refinery Waste Treatment, Engineering-Science, Inc./Texas, Austin, Texas. | GPO - $1.50 |
| 12020 EJI 07/71 | Inorganic Chemicals Industry Profile, Datagraphics, Inc., Pittsburgh, Pennsylvania. | GPO - $1.75 |
| 12020 GND 07/71 | Projected Wastewater Treatment Costs in the Organic Chemicals Industry, Datagraphics, Inc., Pittsburg, Pennsylvania. | GPO - $1.50 |
| 12020 FPD 09/71 | Inorganic Fertilizer and Phosphate Mining Industries - Water Pollution and Control; by Battelle Memorial Institute, Richland, Washington | GPO - $1.75 |
| 12020 EEQ 10/71 | Treatment of Waste Water from the Production of Polyhydric Organics, Dow Chemical Company, Texas Division, Freeport, Texas | GPO - $1.75 |

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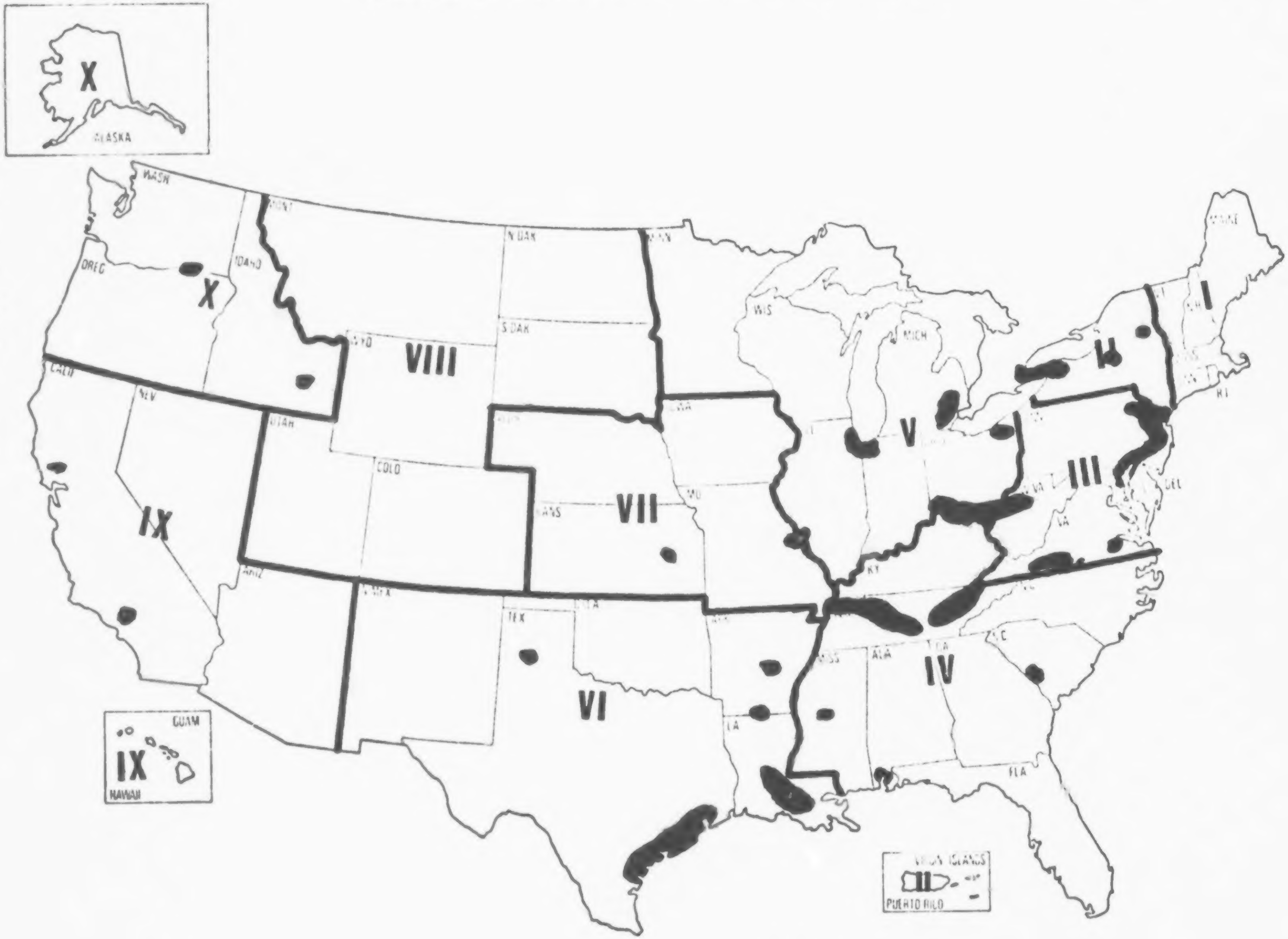
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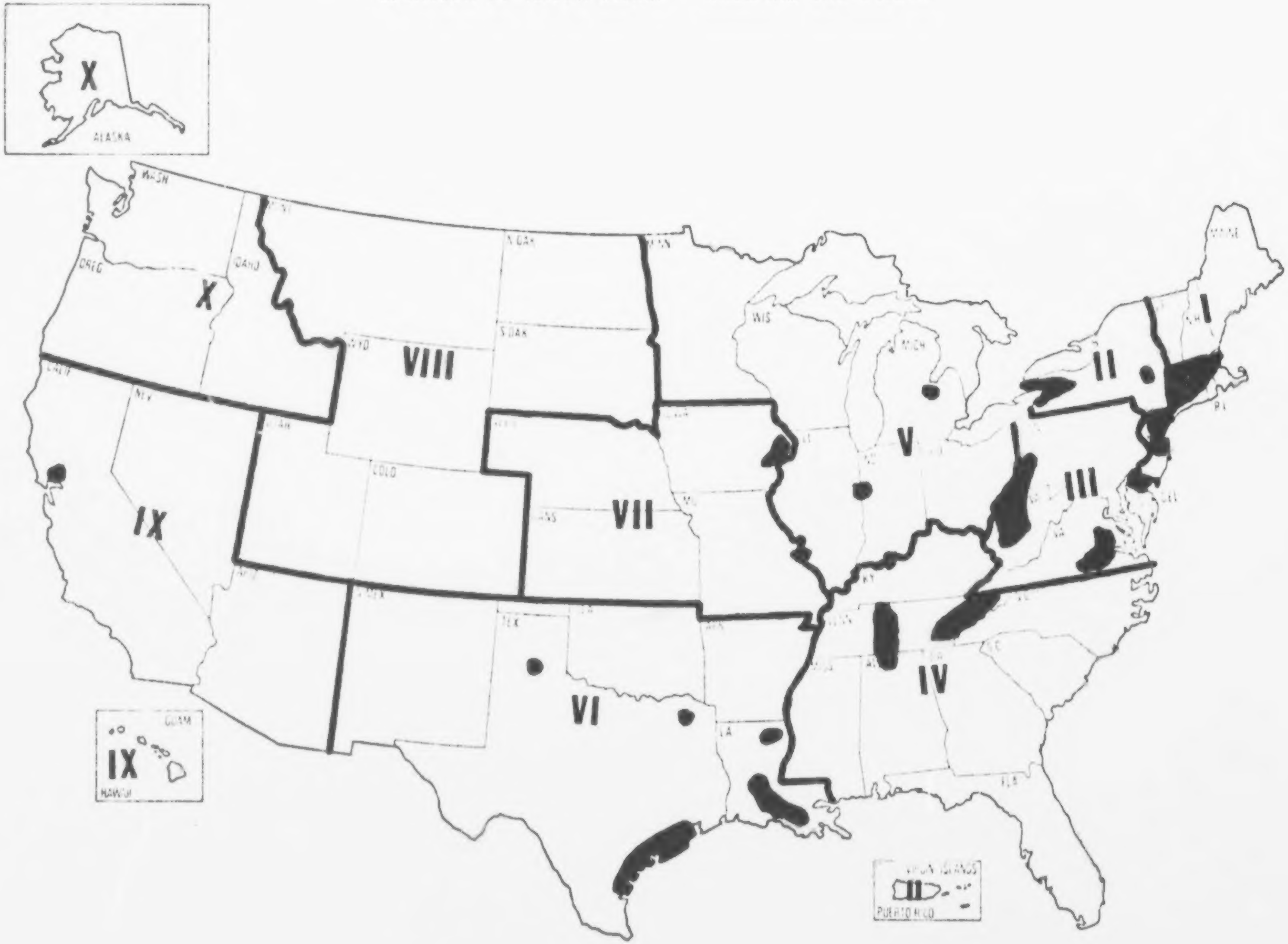
LOCATION OF MAJOR ORGANIC CHEMICAL INDUSTRIES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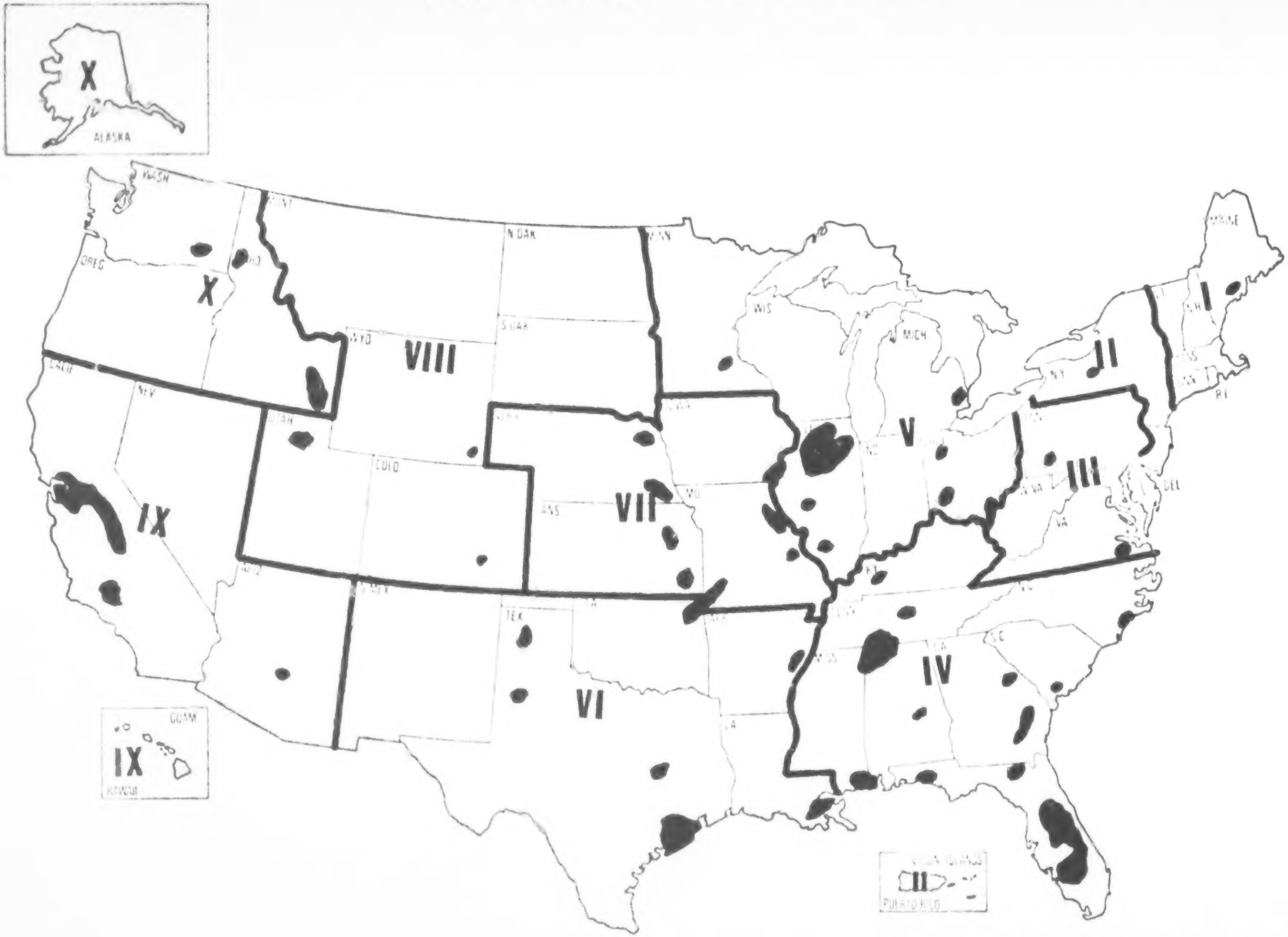
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# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Contract , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 DMT

TITLE OF PROJECT: The Characteristics and Pollutional Problems Associated with Petrochemical Wastes

GRANTEE OR CONTRACTOR:
Engineering Science, Inc.
150 East Foothill Blvd.
Arcadia, California 19006

EPA PROJECT OFFICER:
James Horn
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Austin, Texas

DESCRIPTION OF PROJECT

Award Date: September 25, 1968  Project Cost: $11,190

Completion Date: April 15, 1969  Federal Cost: $11,190

Summary:

The general scope of the project, as developed under the plan of operation, includes a detailed development of the following:

1. History and projection of the petrochemical industry.
2. Definition, magnitude, and pollutants associated with these waste treatment problems.
3. Evaluation of control, treatment and disposal practices.
4. Listing of the special legal problems involved with petrochemical waste management.
5. Determination of the economic feasibility of present and future control methods, reflecting downstream uses.
6. Evaluation of research needs.

The objectives of this proposed project were achieved through a well coordinated plan of operation. A complete literature review was conducted using the numerous volumes available in the numerous libraires located on the University of Texas campus. Additional information was obtained from various governmental agencies and selected industries. Additional data derived from the unpublished Environmental Health Engineering Reports was also utilized.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EXG

TITLE OF PROJECT: The Effects of Chlorination on Treated Organic Chemicals

GRANTEE OR CONTRACTOR:
Manufacturing Chemists Assoc., Inc.
1825 Connecticut Avenue, N.W.
Washington, D.C. 20009

EPA PROJECT OFFICER:
Dr. Hend Gorchev
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Leonia, New Jersey 07650

DESCRIPTION OF PROJECT

Award Date: March 26, 1970 Project Cost: $60,000

Completion Date: June 26, 1971 Federal Cost: $42,000

Summary:

The basic objectives of this project is to conduct a study to determine any adverse effects that might result from the chlorination of certain industrial chemicals either before or after biological treatment. More specific aims are the following:

1. Evaluation of the effect of selected organic chemicals and their degradation products on chlorine demand and disinfection efficiency.
2. Determination, for selected chemicals, of cases in which it is possible to form chlorinated compounds during disinfection of the treated effluent.
3. Determination of the physical properties and degradation rate of any chlorinated compounds found.
4. Examination of the influence of persistent chlorinated compounds on the stream biota, in which several levels of life forms will be considered.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Demonstration *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EMI

TITLE OF PROJECT: Concentration and Removal of Industrial Wastes by Dialysis

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| State of Louisiana<br>Department of Commerce and Industry | James Horn<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: New Orleans, Louisiana

DESCRIPTION OF PROJECT

Award Date: April 17, 1970 Project Cost: $67,262.64

Completion Date: April 17, 1972 Federal Cost: $32,539.00

Summary:

The objectives of the proposed research are the following:

1. Investigation of the phenomenon of dialysis with a view toward developing a satisfactory theory of selective migration and generating an appropriate mathematical statement.
2. Comparison of the efficiency of various types of dialysis equipment with respect to selectivity and mobility of solute particles in various media and thereby to develop parameters by which dialyzer membrane and optimal operating conditions can be determined for a number of typical industrial waste streams.
3. Evaluation of the economics of dialysis as a tool in removing pollutants from industrial wastes and concentrating them to the extent that recoverability becomes feasible.
4. Design of dialysis equipment for continued research and for pilot plant scale studied for possible industrial applications.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 FPD

TITLE OF PROJECT: Water Pollution and Its Control in the Inorganic Fertilizer and Phosphate Mining Industries

GRANTEE OR CONTRACTOR:
Battelle-Northwest
P.O. Box 999
Richland, Washington

EPA PROJECT OFFICER:
Thomas Sargent
Southeast Water Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Richland, Washington

DESCRIPTION OF PROJECT

Award Date: April 17, 1970 Project Cost: $24,750

Completion Date: September 1, 1971 Federal Cost: $23,500

Summary:

A state-of-the-art survey was made of the water pollution problems which result from the production of inorganic fertilizers and phosphate rock. Information required to complete the study was obtained through an extensive literature search, questionnaires sent to the major fertilizer producers, and visits to selected production plants. Ninety-eight plants representing 33 different companies were surveyed. Production figures since 1940 and estimates of production through 1980 were accumulated for phosphate rock and the major fertilizer products. The specific production operations which are the principal generators of contaminated wastewaters were identified, and the wastewater volumes and compositions for each operation were determined wherever possible. The capability of current technology to treat and control the contaminated wastewaters generated by the fertilizer industry was evaluated. Problem areas where additional research and development effort is needed to provide adequate control of wastewater discharge were identified. In most cases the fertilizer and phosphate rock industries are meeting current water quality standards. Disposal by dilution is widely practiced by both industries. As water quality standards become more restrictive new treatment methods will have to be developed.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 FYE

TITLE OF PROJECT: Characteristics and Pollutional Problems of Pesticide Manufacturing Wastes

GRANTEE OR CONTRACTOR:
Department of Civil Engineering
University of Texas
Austin, Texas

EPA PROJECT OFFICER:
Thomas Sargent
Southeast Water Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Austin, Texas

DESCRIPTION OF PROJECT

Award Date: June 30, 1970
Project Cost: $26,183

Completion Date: December 31, 1971
Federal Cost: $24,143

Summary:

In this project a state-of-the-art study and survey will be conducted on practices and research needs pertaining to wastewater treatment and pollution control technology related to pesticide-herbicide manufacturing industry.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 GLN

TITLE OF PROJECT: Extration of Chemical Pollutants from Aqueous Industrial Streams with Volatile Solvents

GRANTEE OR CONTRACTOR:
University of California
Berkeley, California

EPA PROJECT OFFICER:
James Horn
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: December 21, 1970 Project Cost: $37,973

Completion Date: December 20, 1971 Federal Cost: $35,647

Summary:

This project will obtain necessary physico-chemical and engineering data for designing a full-scale plant for removing organic solutes from aqueous, industrial waste streams as found in petroleum-refining and petrochemical plants. Toward that end experimental studies will be made of pertinent physical properties and a mini-plant demonstration unit will be constructed and operated.

Removal of solutes from water is achieved by extraction. The extraction solvent is a volatile fluid whose ability to dissolve solutes is sensitive to small changes in temperature and pressure. As a result of this sensitivity regeneration of solvent is easily achieved.

The demonstration unit will operate with actual wastewaters obtained from petroleum refineries and petrochemical plants. Operating data will be used for scale-up and for preparing cost estimates for a full-scale plant.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 Contract , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 14-12-435 (PPB 12020)

TITLE OF PROJECT: Cost-Effectiveness of Industrial Wastewater Treatment Practices

GRANTEE OR CONTRACTOR:
C.W. Rice and Company
15 Noble Avenue
Pittsburgh, Pennsylvania 15205

EPA PROJECT OFFICER:
George Rey
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Pittsburgh, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 28, 1968 Project Cost: $56,250

Completion Date: October 28, 1968 Federal Cost: $56,250

Summary:

The final report to this project presents an estimate of the costs that would be incurred by the organic chemicals industry in attaining various levels of pollution abatement over a five-year period and gives a generalized methodology by which similar continuing estimates can be made for other water-using industries. Cost estimates have been based upon published data, general data derived from information in the files of the contractors on industrial waste treatment methods and costs, and specific data from 53 organic chemicals plants; the latter specific data were used to verify the applicability and accuracy of the former and also to develop and test the generalized methodology.

It should be emphasized that the total costs given in this report are for the construction and operation of waste treatment facilities for the industry as a whole and cannot be used to determine costs for individual plants. Organic chemicals plants vary greatly in size, level of technology, product mix, etc., and a "typical" or "average" plant exists only in a statistical sense. The costs given are, in general, for waste treatment facilities only, i.e., for "battery limit" industrial waste treatment plants. The costs entailed in process changes, disruption of plant operations, sewer segregation, monitoring and reporting waste treatment efficiency, etc., particularly in older plants, are not included. Such costs are practically impossible to estimate in the aggregate and may add 40 per cent or more to the installed costs of facilities. Total costs for particular plants can only be estimated by detailed engineering studies; the unit costs in the final report should be of value to engineers in making such estimates.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 DIS

TITLE OF PROJECT: Anaerobic Treatment of Synthetic Organic Wastes

GRANTEE OR CONTRACTOR:
Union Carbide Corp.
R&D Department
Bound Brook, New Jersey 08805

EPA PROJECT OFFICER:
James Horn
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: South Charleston, West Virginia

DESCRIPTION OF PROJECT

Award Date: December 11, 1968 Project Cost: $314,859

Completion Date: June 30, 1971 Federal Cost: $220,400

Summary:

The objective of this project is to determine the technical and economic feasibility of an anaerobic-aerobic process for the treatment of composit organic chemical wastes from a complete petrochemical complex. Optimum results will be demonstrated on a 5000-gpd scale treatment facility to obtain design data and establish operating criteria for larger scale installations. The demonstration will be conducted subject to a technical and economic feasibility study based on laboratory-scale research studies. The project will be for a two-year period and will be initiated at the Union Carbide Technical Center at South Charleston, West Virginia.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EGM

TITLE OF PROJECT: Removal of Nitrogenous Compounds from a Fertilizer Plant Effluent Using Modified Operation of Conventional Waste Treatment Systems

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Farmers Chemical Association, Inc.<br>Box 87<br>Harrison, Tennessee | Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street - N.E.<br>Atlanta, Georgia 30309 |

Project Site: Tyner, Tennessee

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | April 15, 1969 | Project Cost: | $220,300 |
| Completion Date: | April 14, 1972 | Federal Cost: | $154,210 |

Summary:

This project involves the full-scale development and demonstration of the treatment of nitrogenous fertilizer effluents using stripping or oxidation pretreatment techniques. Bio-nitrification in a conventional trickling-filter sewage treatment plant, as modified for the purpose of providing an optimized removal of nitrogenous materials in the waste, will follow the pretreatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 DQC

TITLE OF PROJECT: Polymeric Materials for Treatment and Recovery of Petrochemical Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Commerce and Industry<br>State of Louisiana | James Horn<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: Gulf South Research Institute
Baton Rouge, Louisiana

DESCRIPTION OF PROJECT

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|---|---|---|---|
| Award Date: | April 16, 1969 | Project Cost: | $68,992 |
| Completion Date: | October 16, 1970 | Federal Cost: | $48,295 |

Summary:

Reverse osmosis has been used as a unit operation to study the recovery of products from industrial waste streams. Precursory examination of several industrial wastes was performed in this project.

The recovery of glycerin from a petrochemical waste stream containing inorganics and polyglycerins has been studied in detail with the results applied to the design of an effective process scale unit. Membranes employed were asymmetric cellulose acetate butyrate and cellulose acetate. The pilot-scale experimental studies were performed with tubular membrane modules which readily accommodated the sample plant stream being studied.

Good separation was achieved operating between 600 and 800 psig for best selectivity. The product throughput rate appeared the limiting consideration and proved sensitive to increased turbulence and reduced feed vicosities, the latter achieved by dilution.

The pilot-unit data were used to design a countercurrent multi-stage battery to achieve even closer separations. It is shown that sufficient glycerin could be recovered to provide an attractive return on the required investment.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EEQ

TITLE OF PROJECT: Treatment of Wastewaters Resulting from the Production of Polyhydric Organic Compounds

GRANTEE OR CONTRACTOR:
The Dow Chemical Company
Texas Division
Freeport, Texas

EPA PROJECT OFFICER:
James Horn
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Freeport, Texas

DESCRIPTION OF PROJECT

Award Date: June 13, 1969
Project Cost: $282,490

Completion Date: June 13, 1971
Federal Cost: $197,740

Summary:

The basic goal in this project is to develop a method of treatment of wastes from polyhydric manufacturing processes. Several alternative treatment methods will be examined to determine their technical, engineering, and economic feasibility. The results will be used to develop a conceptual design of a waste treatment facility for the briny wastes resulting from this chemical industry. Processes to be evaluated are aerobic biological systems, solvent extraction, foam fractionation, dialysis, and adsorption. Studies will include laboratory, bench-scale, and pilot-plant scale testing.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 Contract, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EJI

TITLE OF PROJECT: Inorganic Chemical Industry Profile Profile

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Datagraphics, Incorporated<br>4790 William Flynn Highway<br>Allison Park, Pennsylvania | George Rey<br>Industrial Pollution Control Branch<br>Water Quality Research, EPA<br>Washington, D.C. 20242 |

Project Site: Pittsburgh, Pennsylvania

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 27, 1969 | Project Cost: | $55,327 |
| Completion Date: | January 27, 1970 | Federal Cost: | $55,327 |

Summary:

The final report to this project presents a description of the inorganic chemical industry and the costs that the industry would incur in attaining various levels of pollution abatement over the five-year period through 1974. For the study purposes, the inorganic chemical industry has been defined as including establishments producing alkalies and chlorine, industrial gases, inorganic pigments, paints and allied products, fertilizers (excluding ammonia and urea), inorganic insecticides and herbicides, explosives, and other major industrial inorganic chemicals. The report presents in considerable detail the description of the various production processes, the waste treatment methods practiced, and the possible impact that changes in processes might have on the volume and character of the wastes produced.

Projections have been based upon the chemical industry data in the 1963 and 1967 Census of Manufacturers, the 1967 Manufacturing Chemists Association survey, and the 1968 FWPCA study of the organic chemicals industry. Costs of treatment are estimated by year for the levels of treatment corresponding to 27 per cent and 100 per cent removal of contaminants. Data from 59 inorganic chemical plants were obtained as primary input to the study.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12020 EAS

TITLE OF PROJECT: Demonstration of the Recondition and Reuse of Organically Contaminated Brines from Chemical Process Industries

GRANTEE OR CONTRACTOR:
The Dow Chemical Company
1000 Main Street
Midland, Michigan 48640

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Midland, Michigan

DESCRIPTION OF PROJECT

Award Date: June 30, 1969

Project Cost: $1,300,408

Completion Date: June 29, 1971

Federal Cost: $509,810

Summary:

The development and demonstration of a chemical-adsorption process for wastewaters from a phenol manufacturing plant will be performed in this study. The process will treat the wastewaters for the removal and recovery of phenol and acetate. The remaining brine wastewater will be utilized for caustic-chlorine production. The basic process involves the selective separation of organic constituents by activated carbon beds. Beds will be regenerated by chemical means.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**

**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EID

TITLE OF PROJECT: Preliminary Investigational Requirements - Petrochemical and Refinery Waste Treatment Facilities

GRANTEE OR CONTRACTOR:
Engineering Science, Inc.
150 East Foothills Blvd.
Arcadia, California 91006

EPA PROJECT OFFICER:
George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Austin, Texas

DESCRIPTION OF PROJECT

Award Date: June 30, 1969
Project Cost: $17,000

Completion Date: March 30, 1970
Federal Cost: $17,000

Summary:

The objectives of this project include the compilation, interpretation, and presentation of the pertinent aspects which constitute a preliminary wastewater treatability study for the refining and petrochemical industries. The preliminary investigation relative to the successful treatment of petrochemical and refinery wastewaters should include those factors essential in the proper development of design criteria for pollution abatement and control facilities. The wastewater survey is the basis from which a treatability study can be developed, and necessarily includes locating, analyzing, and properly interpreting the nature of pollutional sources within a petrochemical or refinery complex.

The treatability study, whether it involves chemical, biological, or physical treatment, must necessarily be programmed to yield definitive information concerning pollutional removal rates, anticipated levels of residual or non-removable constituents, and treatment process requirements. Translating bench- or pilot-scale data to prototype design then must incorporate proper scale-up factors.

The overall project of evaluating the treatability of a wastewater is predicated on the assimilation of sufficient information from which the optimal selection of treatment processes can be made. Given manpower and cost constraints in view of this objective, the scope of any treatability study must be carefully planned and properly implemented.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**

**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EAW

TITLE OF PROJECT: Ocean Disposal of Industrial Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| E. I. du Pont de Nemours and Co. | John Ulshoefer |
| Pigments Department | Hudson-Delaware Basin Office, EPA |
| Wilmington, Delaware 19898 | Edison, New Jersey 08817 |

Project Site: Wilmington, Delaware

DESCRIPTION OF PROJECT

Award Date: July 1, 1969 Project Cost: $874,452

Completion Date: September 1, 1971 Federal Cost: $150,116

Summary:

In this project the various technical and economic aspects of the dispersal of an acid-iron industrial waste at sea over the continental shelf of the Atlantic off the coast of Delaware will be evaluated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12020 EFW

TITLE OF PROJECT: Armour Industrial Chemical Company Secondary Wastewater Treatment

GRANTEE OR CONTRACTOR:
Armour Industrial Chemical Co.
Chicago, Illinois 60611

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: McCook, Illinois

DESCRIPTION OF PROJECT

Award Date: October 6, 1969

Completion Date: July 5, 1972

Project Cost: $503,000

Federal Cost: $210,500

Summary:

The development and demonstration of a secondary treatment biological process to reduce the effluent from a fatty acid derivatives chemical plant to less than 100 ppm of hexane soluble materials will be undertaken. Development work includes the evaluation of an existing pilot-plant test unit, to be followed by a full-scale (0.5 mgd) demonstration at the Armour plant in McCook, Illinois. The treated effluent water quality improvement, obtainable by use of a tertiary treatment process, will also be explored on a pilot scale.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EGC

TITLE OF PROJECT: Treatment and Disposal of Complex Chemical Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| State of Alabama<br>Geological Survey and Oil & Gas Board<br>University, Alabama | Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street, N.E.<br>Atlanta, Georgia 30309 |

Project Site: Tuscaloosa, Alabama

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | October 20, 1969 | Project Cost: | $989,525 |
| Completion Date: | April 19, 1973 | Federal Cost: | $314,525 |

Summary:

In this program, development and evaluation of a surface or subsurface method for control of pollution from a complex chemical waste from a petrochemical complex, manufacturing alkyd resins and phenols, will be performed. Development of the methodology and/or testing techniques to permit projections of the fate of waste components and the waste assimulative capacity of deep geological formations will be also made.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 ERM

TITLE OF PROJECT: Ion-Exchange Effluent Treatment Unit (PET)

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Mineral Pigments Corporation<br>Muirkirk, Maryland | John Ciancia, Chief<br>Industrial Waste Research<br>Hudson-Delaware Basins Office, EPA<br>Edison, New Jersey 08817 |

Project Site: Muirkirk, Maryland

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | October 30, 1969 | Project Cost: | $226,422 |
| Completion Date: | July 3, 1972 | Federal Cost: | $115,967 |

Summary:

Development and demonstration of the use of an ion-exchange process for recovery of chromate from chromate wastewaters containing high concentrations (>1000 ppm) of chromate will be undertaken. The proposed process is one which is used for dilute chromate content cooling tower waters.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 FER

TITLE OF PROJECT: Identification and Control of Petrochemical Pollutants Inhibiting Anaerobic Treatment Processes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Union Carbide Corporation | J. H. Ferguson |
| Research and Development Dept. | Water Quality Office, EPA |
| P.O. Box 8361 | 303 Methodist Bldg. |
| South Charleston, West Virginia 25303 | Wheeling, West Virginia 26003 |

Project Site: South Charleston, West Virginia

DESCRIPTION OF PROJECT

Award Date: February 11, 1970 Project Cost: $67,050

Completion Date: December 10, 1971 Federal Cost: $46,936

Summary:

The objectives of this project are to identify chemicals in the wastewater from a large petrochemical plant that are inhibitory to anaerobic treatment and to study applicable means to eliminate such inhibition. As an initial step, inhibitory chemicals will be identified by performing batch degradability studies in conjunction with analysis by the latest methods available at the Union Carbide Technical Center in South Charleston, West Virginia. Materials of particular interest will be sulfates, $\alpha$-$\beta$ unsaturated carbonyl compounds, and ammonia. A second study will involve the use of a photosynthetic bacterial-algal culture to overcome sulfide problems (i.e. microbial inhibition and oxygen demand). Digestion studies in which a degradable substrate is spiked with various levels of inhibitory materials will be made to indicate allowable levels. A final demonstration run in pilot facilities using typical wastewaters is planned to verify the findings of the laboratory study.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 FOH

TITLE OF PROJECT: Geigy Chemical Waste Treatment Facility

GRANTEE OR CONTRACTOR:
Geigy Chemical Corporation
P.O. Box 2055
Edgewood Station
Providence, Rhode Island 02905

EPA PROJECT OFFICER:
D.H. Stonefield
New England Basins Office, EPA
240 Highland Avenue
Needlam, Massachusetts 02194

Project Site: Cranston, Rhode Island

DESCRIPTION OF PROJECT

Award Date: March 24, 1970
Project Cost: $1,268,300

Completion Date: September 24, 1972
Federal Cost: $392,600

Summary:

The objectives of this project are:

1. Demonstration of the feasibility of a multi-stage (three or more) plastic media trickling filter process for wastewaters from multiple organic chemicals plant.
2. Development and demonstration of the technical feasibility of total process control by automated systems for the process.
3. Evaluation of the performance of a specific design of plastic media.
4. Demonstration of the stage-wise acclimation of micro-organisms as a factor in attaining extra high loading per unit of trickling filter packing.
5. Evaluation of the performance of an additional treatment operation for further effluent quality improvement.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 Contract *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 GND

TITLE OF PROJECT: Projected Wastewater Treatment Costs in the Organic Chemical Industry

GRANTEE OR CONTRACTOR:
Datagraphics, Incorporated
4790 William Flynn Highway
Allison Park, Pennsylvania

EPA PROJECT OFFICER:
George Rey
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Pittsburgh, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: October 22, 1970 Project Cost: $6,735

Completion Date: June 1, 1971 Federal Cost: $6,735

Summary:

The final report to this project presents a description of the organic chemical industry and the costs the industry would incur in attaining various levels of pollution abatement over the five-year period through 1974. For the study purposes, the organc chemical industry has been defined as SIC 2815 (cyclic intermediates, dyes, organic pigments [lakes and toners], and cyclic [coal tar] crudes); SIC 2818 (organic chemicals, not elsewhere classified); portions of SIC 2813 (industrial gases); portions of SIC 2879 (agricultural chemicals, not elsewhere classified); and portions of SIC 2871 (fertilizers). Organic gases only were included from SIC 2813 and ammonia and urea only from the fertilizer industry. The report presents in considerable detail the description of the various production processes, the waste treatment methods practiced, and the possible impact that changes in processes might have on the volume and character of the wastes produced.

Projections have been based upon the chemical industry data in the 1963 and 1967 Census of Manufacturers and upon data obtained from 53 organic chemical plants. Costs of treatment are estimated by year for six levels of treatment from removal of gross pollutants to 100 per cent removal of contaminants.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 GLF

TITLE OF PROJECT: Hartig Pond Closing System - Phosphate Chemical Plants

GRANTEE OR CONTRACTOR:
State of Florida Department of
Air and Water Pollution Control
315 South Calhoun Street
Suite 300, Tallahassee Bank Bldg.
Tallahassee, Florida 32301
Project Site:

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street - N.E.
Atlanta, Georgia 30309

DESCRIPTION OF PROJECT

Award Date: December 1, 1970

Completion Date: July 1, 1973

Project Cost: $2,668,699

Federal Cost: $506,709

Summary:

A commercial-scale demonstration of the feasibility of air and water pollution control from wet-process phosphoric acid manufacturing plants will be undertaken in this project. The proposed system is to provide a closed wastewater cycle thereby providing for essentially complete recovery of phosphate and fluoride chemicals normally lost to the environment under past practices and for virtual elimination of the discharges of wastewater effluents to ground and/or surface waters.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 EPH

TITLE OF PROJECT: Anaerobic-Aerobic Chemical Waste Treatment

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Celanese Corporation of America<br>522 Fifth Avenue<br>New York, New York 10036 | James Horn<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: Bay City, Texas

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 1, 1971 | Project Cost: | $600,000 |
| Completion Date: | September 1, 1973 | Federal Cost: | $395,340 |

Summary:

The proposed project will study and demonstrate the economics and process parameters of a bio-oxidation disposal system for high-strength organic wastes on a commercial scale and compare the economics to deep-well disposal.

Additionally, the project will:

1. Investigate the anaerobic conversion of intractable organic compounds to aerobically bio-degradable species to reduce the COD and BOD to levels suitable for discharge to receiving waters or for reuse.
2. Study the nitrate removal characteristics of the anaerobic-aerobic systems.
3. Demonstrate the use of automatic on-stream total organic carbon analyzers as process controllers and/or monitors.
4. Investigate the effects of series and parallel operation, changes in recycle rates, and dilution on the process efficiency.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800766

TITLE OF PROJECT: Optimizing a Petrochemical Waste Bio-Oxidation System Through Automation

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| The Dow Chemical Company<br>Texas Division<br>Freeport, Texas 77541 | James A. Horn |

Project Site: Freeport, Texas

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | January 11, 1972 | Project Cost: | $226,574 |
| Completion Date: | July, 1973 | Federal Cost: | $142,250 |

Summary:

Covers the installation and operation of control systems on an existing activated sludge pilot plant. These control devices will allow for monitoring and assessing the nature and amount of the biological process variation, and by "feedback" and "feedforward" responses, will compensate for these variations so as to maintain a high rate of removal. The results will be employed to develop a conceptual design of a waste treatment facility for alkaline, saline and organic-laden wastes generated from a manufacturing process producing polyhydric compounds.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b)*, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800300

TITLE OF PROJECT: Ultraviolet Chlorination of Organic Acids in Waste Brines

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>The Dow Chemical Co.<br>Midland, Mn. 48640 | EPA PROJECT OFFICER:<br>R.R. Swank<br>Southeast Water Laboratory<br>Athens, GA. |

Project Site: Midland, Michigan

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: June 30, 1972 | Project Cost: $196,428 |
| Completion Date: May, 1973 | Federal Cost: $108,250 |

Summary:
The objectives of this demonstration project are to study evaluate:

1. Effects of ultraviolet light placement, chlorine concentration operating temperature, and flow rate on removal efficiency.
2. Vent gas composition.
3. Corrosive effects of process streams on the equipment.
4. Large scale instrumentation requirements.
5. Treatment chemical unit ratios.

In addition to the above demonstration study on the removal of acet acid from waste brines by UV chlorination, laboratory studies will be conducted in a mini-plant reactor to determine the applicability of the process to other aliphatic acids, namely, glycolic, lactic, chloroacetic, propionic, and butyric acids. These additional studies will entail determination of:

1. Reaction rates as a function of pH at a temperature of 95° C and acid concentrations in the range of 1,000 - 2,000 mg/l at a constant $Cl_2$ concentration of 10 mg/l.
2. Optimum pH for each acid.
3. Chloride ion dependence.
4. Quantum yields of glycolic and lactic acids and comparison of results with no UV usage.
5. Vent gas material balance by mass spectroscopy.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5R *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800947

TITLE OF PROJECT: Extraction or Destruction of Chemical Pollutants from Industrial Wastewater Streams

GRANTEE OR CONTRACTOR:
Texas A&M Research Foundation
P.A. Faculty Exchange H
College Station, TExas 77843

EPA PROJECT OFFICER:
L. Frank Mayhue

Project Site: College Station, Texas

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | March 7, 1972 | Project Cost: | $38,531 |
| Completion Date: | (12 mos.) March, 1973 | Federal Cost: | $34,928 |

Summary:

The Texas A&M Research Foundation proposes to investigate, recommend methods and procedures, and make preliminary designs for advanced waste treatment processes for the reduction of contaminates in petrochemical plant waste effluent streams, equivalent to or exceeding second stage biological treatment processes. The waste products to be reduced will include halogenated hydrocarbons and other refractory compounds which effect potable water supplies, aquatic and marine life in the lower Mississippi River with respect to taste, tainting, and odor. The primary objectives of this proposed research project are: (1) to accomplish the necessary bench work to quantitatively evaluate how selected petrochemical waste streams can be treated economically by solvent extraction and ozone oxidation; (2) to obtain distribution, performance, and other data necessary for preliminary design of in-plant continuous flow pilot plants for both solvent extraction and solvent recovery systesm; (3) to construct and operate a continuous flow bench-scale pilot plant to determine performance and design data on how waste streams can be treated economically by ozone oxidation; (4) to make preliminary designs of continuous flow in-plant pilot plants for the previous processes; (5) to determine and recommend the most suitable types of equipment for the previous processes and prepare cost estimates and economics for the full-scale industrial process units.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801030

TITLE OF PROJECT: Extraction of chemical Pollutants from Aqueous Industrial Streams with Volatile Solvents

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| University of California<br>Chemical Engineering Dept.<br>Berkeley, California 94720 | James Horn |

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

| | | | | |
|---|---|---|---|---|
| Award Date: June 14, 1972 | Project Cost: | 48,673 | (2nd year) |
| Completion Date: April, 1973 | Federal Cost: | 45,618 | (2nd year) |

Summary:

(a) To obtain experimentally fundamental physico-chemical data on the distribution of various pertinent chemical solutes (alcohols, phenols, aldehydes, ketones, etc.) between water and candidate volatile solvents, as a function of temperature, pressure and solute concentration. The solvents include carbon dioxide, isobutylene and propane.
(b) To establish a correlation for distribution coefficients.
(c) To construct and operate bench-scale, continuous-flow demonstration units (mini-plants) for quantitative evaluation of the extraction process as applied to waste-stream samples from petroleum-refining and petrochemical plants.
(d) To obtain experimentally fundamental physical data (interfacial tensions, diffusivities, mass transfer rates, etc.) and operating data required for scale-up of an efficient extraction process.
(e) To demonstrate the workability of extraction with volatile solvents as a method for treating typical concentrated petroleum and petrochemical waste waters on a sustained basis.
(f) To determine the most suitable type of extraction contactor and to measure and correlate its extraction efficiency.
(g) To evaluate critically performance data from the demonstration unit toward an economic optimization of design variables.
(h) To make a preliminary design of a full-scale industrial extraction process and to prepare cost estimates.
(i) To establish, on the basis of engineering studies, the classes (or types) of industrial waste waters which can be treated economically by extraction with volatile solvents.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800554

TITLE OF PROJECT: Carbon Sorption and Regeneration for Petrochemical Waste Treatment

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>University of Missouri<br>Columbia, Missouri 65201 | EPA PROJECT OFFICER:<br>L. Frank Mayhue |

Project Site: Columbia, Missouri

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: March 16, 1972 | Project Cost: $38,520 |
| Completion Date: April, 1973 | Federal Cost: $36,444 |

Summary:

The subject proposal is a two part program: (1) to determine the specific response of spent activated carbon to regeneration, and (2) to develop and fabricate two carbon adsorption pilot plants. A departure from the traditional empirical approach to activated carbon regeneration will be made in an effort to evaluate the basic parameters, techniques, and requirements of the regeneration process. The successful completion of the project will make a significant contribution to the understanding of regeneration phenomena. An optimum economic utilization of the overall carbon adsorption process will be the end result, thereby placing an enhanced value on its use in industrial waste treatment activities.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5R, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800857

TITLE OF PROJECT: Effluent Guidelines for the Inorganic Chemicals Industry

GRANTEE OR CONTRACTOR:
Illinois Institute of Technology
Department of Environmental Engineering
Chicago, Illinois 60616

EPA PROJECT OFFICER:
Elwood E. Martin
Environmental Protection Agency
Washington, D.C. 20460

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: June 19, 1972

Completion Date: March, 1973

Project Cost: $30,972

Federal Cost: $28,695

Summary:

The project will identify types and classes of pollutants present in the organic chemical industry wastewaters; define "normal" ranges of raw waste loads associated with industry production; identify wastewater treatment processes available to the inorganic chemicals industry, and evaluate the effectiveness and cost of these processes relative to significant pollutants; and from these data, establish practical and achievable wastewater effluent guidelines applicable to the inorganic chemical industry. The study will yield a condensed, handbook-type compilation of available information on inorganic chemicals industrial wastewater composition, treatment technology, treatment effectiveness and costs.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5R, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801200

TITLE OF PROJECT: Wastewater Profile of the Plastics, Synthetic Resins, and Fiber Manufacturing Industry

GRANTEE OR CONTRACTOR:
Robert W. Lenz & W. Leigh Short
Chemical Engineering Dept.
University of Massachusetts
Amherst, Massachusetts 01002

EPA PROJECT OFFICER:
Paul E. Des Rosiers

Project Site: Amherst, Massachusetts

DESCRIPTION OF PROJECT

Award Date: June 27, 1972
Project Cost: $31,405

Completion Date: August, 1973
Federal Cost: $29,835

Summary:

Covers the collection and collation of data concerning the wastewater characteristics, existing and planned treatment facilities, waste reductions achieved by existing technology, economics and cost data, and recommendations of remedial measures where present technology is deficient in regards to the Plastics, Synthetic Resins, and Fiber Manufacturing Industry, as delineated in SIC 2821 and SIC 2824 as exists in the United States and in Europe.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800602

TITLE OF PROJECT: Waterborne Wastes of the Paint and Pigments Industry

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Southern Research Institute<br>2000 Ninth Avenue South<br>Birmingham, Alabama 35205 | Herbert S. Skovronek |

Project Site: Birmingham, Alabama

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 20, 1972 | Project Cost: | $35,815 |
| Completion Date: | March 1973 | Federal Cost: | $33,000 |

Summary:

The objectives of the proposed research program are (1) to characterize the subject industries in relation to their wastewater problems, (2) to assess the waste-control technology currently being employed in the subject industries, (3) to determine the best practice now extant, (4) to determine what can be achieved in the way of control of effluent quality with technology now available to these industries, and (5) to recommend remedial measures where present treatment technology is either deficient, lacking, or non-existent. It is anticipated that through pursuit of these objectives it will be possible to define clearly the pollutant-control problems of the Paint and Pigments Industries and to provide a sound basis for the planning of future research and development efforts necessary to the resolution of those problems.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# POWER PRODUCTION (NON-THERMAL)

The R&D program for the power industry receives support under the EPA grant and contract monies from Section 5 and Section 6 of the Clean Water Restoration Act of 1966. The objectives of the program are to:

1. Define the water pollution problem as it pertains to the non thermal aspects of power production.
2. Research, develop, and demonstrate the required technology to achieve at minimum cost the equivalent of best practicable and, best available treatment and closed loop systems.

The objectives are met through the awarding of grants and contracts to universities, industries, and municipalities and through in-house research activities carried out by the Pacific Northwest Laboratory.

The wastewater flows may be identified with the following non-thermal power generating operations: boiler and cooling system blowdown, disposal of air pollution control system wastes, and disposal of water treatment wastewaters and sludges.

## PPB 12030 - POWER PRODUCTION - NON-THERMAL

| 12030 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| GTT | General Telephone Company of California | C | 4-5 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12030 GTT

TITLE OF PROJECT: Elimination of Biocides in Cooling Tower Blowdown By Use of Ozone

GRANTEE OR CONTRACTOR:
General Telephone Company of California
P.O. Box 57
Pomona, California 91769

Project Site: Pomona, California

EPA PROJECT OFFICER:

Lewis Porteous
Office of Research & Monitoring
EPA - Region IX
760 Market Street
San Francisco, CA 94102

DESCRIPTION OF PROJECT

Award Date: March 22, 1971

Project Cost: $82,778

Completion Date: November 21, 1972

Federal Cost: $45,850

Summary:

This 20-month project will evaluate the feasibility of using ozone as a biocide in recirculating cooling towers so as to eliminate the current problems of pollution from the residual biocides in cooling tower blowdown. The plan of operation for the project calls for the evaluation of ozone as a biocide for 3-month periods covering the following modes of operation: ozone as a biocide only; ozonation and controlled bleed for total chemical elimination; ozonation, controlled bleed and partial softening for water conservation; and ozonation and total demineralization to provide a complete recycling-closed system.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

## PPB 12040

## PAPER AND ALLIED PRODUCTS

Activities under this subprogram element encompass those industries engaged in the production of pulp, paper, paperboard, and related paper products. Dun and Bradstreet lists 6,683 production establishments under "Standard Industrial Classification" (SIC) Number 26, titled "Paper and Allied Products," while Lockwood's Directory indicates there are 542 independent paper mills, 278 paper mills with one or more associated pulp mill, and 32 independent pulp mills. It is toward these 852 production establishments that the effort of EPA's research and development program is directed. The R&D program is headquartered in Washington, D.C., but the program support and in-house research is centered at the Pacific Northwest Water Laboratory in Corvallis, Oregon.

It has been estimated that the total waste load developed from this industry represents 27 per cent of the total pollutional load attributed to all manufacturing. Wastes from the industry may show extreme pH variations; extremely high biochemical oxygen demand loads (dependent on the pulping process); high color due to lignin compounds released in pulping and bleaching as well as loss of pigments and dyes in paper making; and a toxic effect on aquatic life at various levels of the food chain and loss of significant amounts of settleable and suspended solids in the form of fiber, dirt, and debris.

The intramural and extramural R&D program is to assist industry in the development of improved in-plant control and waste reduction within the unit manufacturing processes and improved waste treatment processes to be currently employed, as well as advanced treatment methods for the further abatement of pollution. Projects for pretreatment and control in-plant, final conventional and advanced waste treatment, joint municipal treatment, and recovery and utilization of waste by-products are being investigated. Application of in-plant water reuse and waste control plus advanced waste treatment and control processes should eventually gain in the ultimate goal of a closed-loop water system for this industry.

PROJECT INDEX

PPB 12040 - PAPER AND ALLIED PRODUCTS

| 12040 | Grantee or Contracter | Project Status* | Page |
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| EBY | Oregon State University | A | 5-8 |
| EFC | University of Washington | A | 5-9 |
| DLQ | Oregon State University | A | 5-10 |
| DEH | University of Washington | B | 5-11 |
| EXQ | University of Washington | B | 5-12 |
| DBD | Montana State University | C | 5-13 |
| EMY | The Mead Corporation | A | 5-14 |
| EUG | Georgia Kraft Company | A | 5-15 |
| EZZ | University of North Carolina | A | 5-16 |
| EEL | Pulp Manufacturers Research League | A | 5-17 |
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| FUB | Green Bay Packaging, Inc. | A | 5-29 |

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| 12040 | Grantee or Contractor | Project Status* | Page |
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| GLV | WAPORA, Inc. | B | 5-31 |
| HAR | WAPORA, Inc. | B | 5-32 |
| HDU | Georgia - Pacific Corporation | C | 5-33 |
| GQD | Crown Zellerbach Corporation | C | 5-34 |
| HPK | University of Washington | C | 5-35 |
| S800261 | Champion Paper Division, U.S. Plywood Corporation | C | 5-36 |
| S800853 | Institute of Paper Chemistry | C | 5-37 |
| S801207 | Institute of Paper Chemistry | C | 5-38 |
| S800740 | The Chesapeake Corporation of Virginia | C | 5-39 |
| 800520 | Green Bay Packaging Company | C | 5-40 |
| 801206 | Big Chief Roofing Company | C | 5-41 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

## FINAL PROJECT REPORTS

## PPB 12040 - PAPER AND ALLIED PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12040 EUG 10/69 | Foam Separation of Kraft Pulping Wastes, Georgia Kraft Company, Rome, Georgia. | NTIS<br>PB 189 160 |
| 12040 EZZ 04/70 | Dilute Spent Kraft Liquor Filtration Through Wood Chips, School of Forest Resources, University of North Carolina, Raleigh, North Carolina | NTIS<br>PB 191 873 |
| 12040 EBY 08/70 | Aerial Photographic Tracing of Pulp Mill Effluent in Marine Waters, Oregon State University, Corvallis, Oregon. | GPO - $1.25 |
| 12040 ELW 12/70 | Aerated Lagoon Treatment of Sulfite Pulping Effluents, The Crown Zellerback Corporation, Lebanon, Oregon. | GPO - $1.25 |
| 12040 EMY 12/70 | Multi-System Biological Treatment of Bleached Kraft Effluents, The Mead Corporation, Chillicothe, Ohio | GPO - $2.00 |
| 12040 EFC 01/71 | Pollution Abatement by Fiber-Modification, College of Forest Resources, Inst. of Forest Products, University of Washington, Seattle, Washington. | GPO - $ .65 |
| 12040 EEK 08/71 | Treatment of Selected Internal Kraft Mill Wastes in a cooling Tower, Georgia Kraft Company, Rome, Georgia | GPO - $1.25 |
| 12040 DLQ 08/71 | Slime Growth Evaluation of Treated Pulp Mill Waste, Dept. of Microbiology, Oregon State University, Corvallis, Oregon. | GPO - $1.50 |
| 12040 FUB 01/72 | Recycle of Papermill Waste Waters and Application of Reverse Osmosis, by D.C. Morris, W.R. Nelson, and G.O. Walraven, Green Bay Packaging Inc., Green Bay, Wisconsin | GPO - $1.00 |
| 12040 FES 07/71 | Sludge Material Recovery System for Manufacturers of Pigmented Papers, by S.D. Warren Co., A Div. of Scott Paper Company, Environmental Improvement Dept., Westbrook, Maine | GPO - $1.00 |

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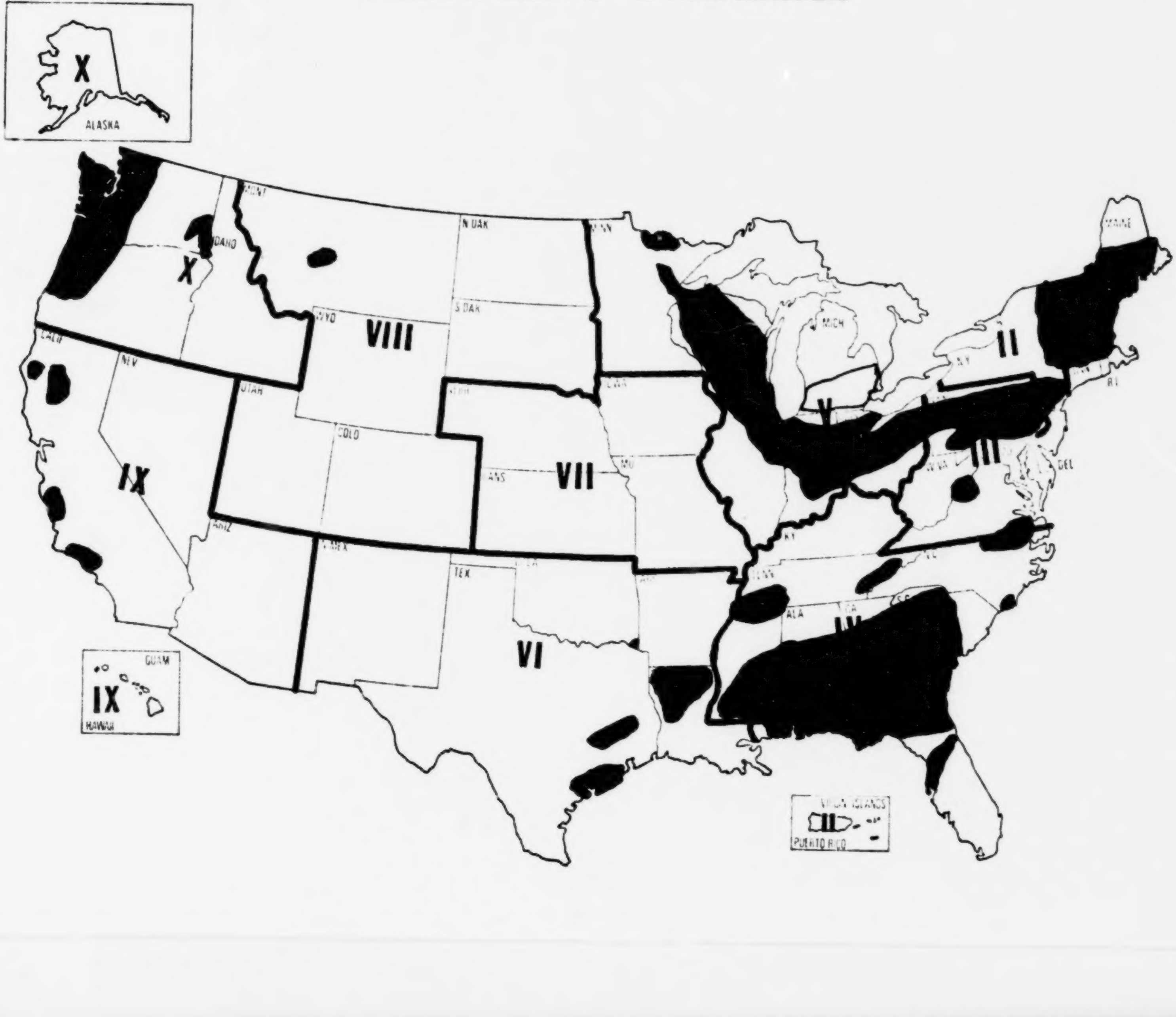
LOCATION OF MAJOR PUL. AD PAPER INDUSTRIES



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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EBY

TITLE OF PROJECT: Aerial Photographic Tracing of Pulp Mill Effluent in Marine Waters

GRANTEE OR CONTRACTOR:
Department of Civil Engineering
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Newport and Gardiner, Oregon
Samoa, California

DESCRIPTION OF PROJECT

Award Date: June 1, 1969

Project Cost: $20,781

Completion Date: August 31, 1970

Federal Cost: $19,237

Summary:

Aerial photography taken of waste plumes from Kraft pulp mill ocean outfalls was shown to be an effective tool in the study of waste disposal sites. This technique is not limited by sea conditions and permits monitoring and evaluation of outfall sites throughout the year. Photography taken at one instant provides comprehensive information throughout the waste field. Manpower requirements and costs for this method are considerably less than for conventional boat sampling surveys.

Field studies were conducted on the waste plumes from Kraft pulp mill ocean outfalls at Newport and Gardiner, Oregon and Samoa, California. Waste concentrations were measured by conventional boat sampling techniques while aerial photography was taken of the outfall area from altitudes ranging from 3,000 to 11,000 ft. Computerized procedures were used to compute water currents, waste concentrations, toxicity zones, and diffusion coefficients from the photography.

Surface water current was found to be the dominant factor in the resulting plume pattern. During periods of low current velocities in the receiving water, the hydraulic head created by the effluent source was a significant factor in the resulting plume shape. The steady state form of the Fickian diffusion equation and unidirectional transport velocity was not applicable to the majority of the observations. Temperature was found not to be an effective tracer for tracking the plume or for estimating waste concentrations since the resulting plume temperature may be greater than, less than, or equal to the surrounding ocean temperature.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EFC

TITLE OF PROJECT: Pollution Abatement by Fiber Modification

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| College of Forest Resources<br>University of Washington<br>Seattle, Washington 98105 | Ralph Scott<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: June 10, 1969 Project Cost: $41,603

Completion Date: January 31, 1971 Federal Cost: $37,850

Summary:

Laboratory studies were conducted in this project to determine if the collection of pollutants from water using fibers was a feasible concept.

Any cellulosic or lignocellulosic fibers can be reacted with di- or tri-halogeno-*s*-triazines in simple aqueous conditions so that about 10 per cent by weight of reactive sites can be built into the fiber. The modified fibers can be regarded as polychloro-*s*-triazinylated fibers in which each *s*-triazine ring contains approximately one or two reactive chlorine atoms. The extent of reaction is generally determined by the stereotopochemistry of the fiber and in particular by its lignin content and its microporous structure. Chloro-*s*-triazines are capable of reacting in aqueous solutions with amines, mercaptans and phenols, typical of those present in pulping wastes and bleach plant effluent. The efficiency of this system is obviously increased as the size of the pollutant removed per reactive fiber size is increased. Methods to increase the size of lignosulfonates by condensation have therefore been developed.

Two new methods for the collection of pollutants by fibers based on oxidative grafting and physical entrapment by hydrodynamic volume changes have also been discovered and a procedure for the characterization of copolymer compositions by surface tension has been established.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 5 Demonstration, Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12040 DLQ

TITLE OF PROJECT: Slime Growth Evaluation of Treated Pulp Mill Wastes

GRANTEE OR CONTRACTOR:
Department of Microbiology
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:
Donald May
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: June 1, 1970

Completion Date: May 31, 1971

Project Cost: $16,965 (2nd year)

Federal Cost: $15,415 (2nd year)

Summary:

This is a continuation of a project initiated in 1969. The objective of this research is to evaluate the slime growth promoting potential of treated pulp mill wastes. Wastes treated by various means will be tested for their ability to support slime growth using various procedures. Additional studies will be carried out in an effort to define specific carbon and nitrogen sources in treated wastes which support the growth of Sphaerotilus. The effects of environmental factors on growth of Sphaerotilus also will be examined. This study will contribute to the development of abatement procedures for controlling slime growth as well as assist in establishing suitable water quality criteria for streams receiving pulp mill wastes. The study also will add to the knowledge on Sphaerotilus.

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 DEH

TITLE OF PROJECT: Studies of Low Molecular Weight Lignin Sulfonates

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Chemical Engineering<br>University of Washington<br>Seattle, Washington 98105 | H.K. Willard<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: September 1, 1970 Project Cost: $32,049

Completion Date: October 31, 1971 Federal Cost: $28,844

Summary:

Studies are being undertaken to isolate and characterize low molecular weight lignin sulfonates which are formed from the lignin in wood by action of sulfite pulping process. Improved separation methods by gel chromatography recently developed in this laboratory will be applied to obtain fractions of rather narrow molecular ranges, expecially in the low molecular weight range.

Information gained should be of assistance in developing economic uses for the waste liquors from sulfite pulp mills which are giving rise to the hazard of pollution of water sources.

Future studies will be devoted to the following subjects:

1. Continuation of molecular weight determinations by vapor-pressure osmometric means.
2. Studies on the practical application of lignosulfonates and the lignex separation process.
3. Investigation of complexing properties of lignosulfonate fractions.
4. Exploratory studies on carboxylation using maleic anhydride.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EXQ

TITLE OF PROJECT: Steam Stripping of Kraft Pulp Mill Effluents

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Chemical Engineering<br>University of Washington<br>Seattle, Washington 98105 | H.K. Willard<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: September 1, 1970 | Project Cost: $32,100 (2nd year) |
| Completion Date: August 31, 1971 | Federal Cost: $28,899 (2nd year) |

Summary:

Three specific aims of the original research program were:

1. To secure further information concerning the nature and concentration of steam-volatile substances present in Kraft pulp mill black liquors and several process conditions.
2. To conduct further laboratory experiments and SEKOR process design studies in order to evaluate several alternate ways of conducting the SEKOR process and to permit the optimum procedure or procedures to be identified.
3. To conduct laboratory and process design studies directed toward the development and evaluation of procedures by which SEKOR oils, arising under various conditions, can be separated on an industrial scale into components or fractions which may be sold to return a significant income to offset the costs of conducting the SEKOR process.

In addition to continuing toward the above objectives, it is also planned to conduct future research at the University in close collaboration with SEKOR related studies which are being developed by investigators associated with the Weyerhaeuser Company in Longview, Washington. The Weyerhaeuser studies mainly will be concerned with mill-scale application of a SEKOR-type process to condensate liquors, but experimentation on black liquors will also be included.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 DBD

TITLE OF PROJECT: Color and Mineral Removal from Kraft Bleach Wastes

GRANTEE OR CONTRACTOR:
Department of Civil Engineering
and Engineering Mechanics
Montana State University
Bozeman, Montana 59715

EPA PROJECT OFFICER:
H.K. Willard
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Bozeman, Montana

DESCRIPTION OF PROJECT

Award Date: June 1, 1971

Completion Date: May 31, 1972

Project Cost: $34,286 (3rd year)

Federal Cost: $30,000 (3rd year)

Summary:

The broad objective of this research project is to determine the economic potential of synthetic resins for the control of pollution from kraft bleach wastes in reuse systems.

More specifically, the objectives are:

1. Exploration of the use of synthetic resins for the removal of color and other refractory organic contaminants.
2. Optimization of the operation of fixed resin beds for sorption and also for demineralization.
3. Determination of economical regenerating methods and innocuous means of waste disposal.
4. Comparison of the relative effectiveness and economy of resins with carbon.
5. Estimation of the cost of wastewater renovation, reuse, and recycle using resins either alone or with other aids.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EMY

TITLE OF PROJECT: Multi-System Biological Treatment of Bleached Kraft Effluents

GRANTEE OR CONTRACTOR:
The Mead Corporation
Chillicothe, Ohio

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Chillicothe, Ohio

DESCRIPTION OF PROJECT

Award Date: December 14, 1966 Project Cost: $428,500

Completion Date: December 13, 1970 Federal Cost: $299,950

Summary:

A multi-unit pilot plant was used to study the biological treatment of integrated Kraft pulp and paper wastewaters after conventional primary clarification. The biological units included two high-rate trickling filters packed with PVC media, an oxidation ditch with brush-type aeration, and an earthen lagoon with mechanical surface aeration. Many alternates were possible because the main feed could be excluded from one or more biological units and, in its place, any of the pilot-unit effluents, except the aerated lagoon, could be pumped back to the main weir box for feed. Simultaneous series and parallel operation of the four biological systems was thus possible. The combinations using normal strength wastewater included: (a) trickling filters in series, (b) trickling filter to aerated lagoon, (c) oxidation ditch to aerated lagoon, and (d) oxidation ditch to trickling filter.

Black liquor was added to the clarified effluent on a continuous basis for a limited period of time in order to elevate the $BOD_5$ level from approximately 200 mg/l to approximately 500 mg/l and the following combinations were tested: (a) trickling filter to oxidation ditch to trickling filter, (b) trickling filter to aerated lagoon, and (c) trickling filters in series followed by oxidation ditch. Best efficiencies at normal effluent strength were obtained on the pilot oxidation ditch when run with clarification and sludge return as the extended aeration process. $BOD_5$ removals as high as 94 per cent were possible. The trickling filter with sludge recycle performed slightly better than the conventional trickling filter. $BOD_5$ removals of 60 to 70 per cent were possible. The conventional aerated lagoon at short detention times was improved by clarification of the treated effluent. $BOD_5$ removals of 80 per cent were possible.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EUG

TITLE OF PROJECT: Foam Separation of Kraft Pulping Wastes

GRANTEE OR CONTRACTOR:
Georgia-Kraft Co.
Rome, Georgia

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Rome, Georgia

DESCRIPTION OF PROJECT

Award Date: August 4, 1967
Project Cost: $68,830

Completion Date: October 31, 1969
Federal Cost: $48,181

Summary:

Laboratory studies of foam separation were conducted to determine the feasibility of this process for reducing BOD, solids content, and foaming tendency of clarified Kraft mill effluent. Since Kraft pulping wastes have a natural tendency to foam, it was expected that the foaming process, which has been found to be useful in treating domestic wastes, might have applications in treatment of these effluents.

Both continuous flow and batch experiments were conducted, and liquid and foam heights, liquid feed rates, air sparging rates, and temperature were varied over wide ranges.

The BOD reduction in the treated liquid was disappointingly small, averaging less than 5 per cent, and the BOD enrichment in the foam phase was in most cases less than 1.5 times that of the feed. Solids removal was correspondingly low.

The cost of using a foam process on kraft mill wastes is extimated to be four to five cents per 1000 gallons of feed; this cost is exclusive of further processing of the concentrated foamate. Based on control of foaming tendency alone, the process would be unattractive from a cost standpoint.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EZZ

TITLE OF PROJECT: Dilute Spent Kraft Liquor Filtration through Wood Chips

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| School of Forest Resources<br>University of North Carolina<br>Raleigh, North Carolina | Ralph Scott<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | August 4, 1967 | Project Cost: | $25,920 |
| Completion Date: | April 30, 1970 | Federal Cost: | $18,144 |

Summary:

The principal objective of this project was to determine if contact between effluent from a Kraft pulp mill and pine chips would reduce the water pollution characteristics of the waste liquor.

The experimental work was divided into two phases: 1) a small scale laboratory investigation of contacting dilute waste liquor with chips; and 2) a pilot-scale investigation of filtering waste liquor through a column and a pile of chips.

It was found that contact of alkaline waste liquor, or even distilled water, with pine chips extracted organic matter from the chips which had a considerable $BOD_5$. This extract corresponded to a pollution load of about 3-11 lbs. $BOD_5$ per ton of dry wood. Alkalinity, pH, and intensity of color of the waste liquor were somewhat reduced by the contact. These reductions are, however, too small to have any practical application in effluent treatment. It can, in general, be concluded that contact of alkaline waste liquor, or water, with wood chips extracts soluble organics and adds pollutional materials to the effluent stream.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EEL

TITLE OF PROJECT: Development of Reverse Osmosis for In-Plant Treatment of Dilute Pulping Industry Wastes

GRANTEE OR CONTRACTOR:
Pulp Manufacturers Research League
Appleton, Wisconsin

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory,EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: August 7, 1967

Project Cost: $690,530

Completion Date: September 30, 1971

Federal Cost: $483,371

Summary:

The project will determine the ability of reverse osmosis technology to both produce a product water suitable for re-use in mill processes and a concentrate available for by-product recovery or for treatment prior to discharge. Wastes to be handled, at separate mills, will include weak sulfite washings, weak Kraft washings, bleach wastes, condensates, and semi-chemical wastes. The semi-trailer housed reverse osmosis equipment will be transported to separate mills for the experimental work. Presently projected mill sites are located in Wisconsin and Minnesota. Others are to be selected.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EEK

TITLE OF PROJECT: Treatment of Selected Internal Kraft Mill Wastes in a Cooling Tower

GRANTEE OR CONTRACTOR:
Georgia-Kraft Co.
Rome, Georgia

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Macon, Georgia

DESCRIPTION OF PROJECT

Award Date: October 14, 1967

Completion Date: August 31, 1971

Project Cost: $411,000

Federal Cost: $287,000

Summary:

Pulp mill condensates, decker filtrate, and turpentine decanter underflow from an 850 ton/day Kraft linerboard mill have been successfully treated in a conventional cooling tower. These waste streams, in combination with the condenser waters from a barometric type evaporator condenser, are cooled in the tower and reused. The overall accomplishments of this process are the removal of about 10,000 lbs of BOD per day and the reduction in overall mill water needs of about 8-10 mgd. Theoretical, laboratory, and pilot studies investigated the BOD removal mechanisms involved and proved that the predominant mechanism is stripping of volatile components. As a part of the laboratory studies a simple procedure called a static vapor-liquid equilibrium method was developed for collecting and analyzing low concentration volatile components in wastewater. Mathematical relationships were developed which allow the translation of the findings of this study to other wastewater treatment applications. The primary factors controlling BOD removal in this system are blowdown rate, liquid-gas ratio, and average temperature. For a blowdown rate of 15-20 per cent of the tower influent, average treatment efficiencies for the waste streams considered are 55-65 per cent for sixth effect condensate, 45-55 per cent for combined condensate and turpentine decanter underflow, and 25-35 per cent for decker filtrate.

The reduction in BOD of these waste streams is believed due primarily to the stripping of methanol. Some biological activity is evident in the tower, however, and the addition of nutrients results in an improvement of 5-10 per cent in BOD removal. The system has several advantages over the conventional surface condenser system used with Kraft mill evaporators. Both operating and capital costs compare favorably with other waste-treatment methods.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (Pl 84-660), as amended.*

PROJECT NUMBER: 12040 ELW

TITLE OF PROJECT: Aerated Lagoon Treatment of Sulfite Pulping Effluents

GRANTEE OR CONTRACTOR:
Crown Zellerbach Corporation
Camas, Washington

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Lebanon, Oregon

DESCRIPTION OF PROJECT

Award Date: December 27, 1967 Project Cost: $802,000

Completion Date: August 31, 1971 Federal Cost: $503,739

Summary:

Secondary treatment of sulfite pulp and paper mill effluents in aerated stabilization basins was tested on a full-scale basis over a 17-month period of continuous operation. The secondary treatment plant consisted of two aeration basins. One basin was equipped with two 75-hp surface aerators and the other basin of equal volume was equipped with six 25-hp aeration units. Piping was designed to permit series and parallel operation of the two basins and provisions were made to recycle treated waste. The waste treated was a mixture of weak wash water from the pulp mill, evaporator condensate from the spent liquor recovery system, and paper machine white water.

Experimentation conducted over the 17-month period showed that series operation was more efficient than parallel operation and that the 75-hp surface aerators were much more efficient mixing and aeration devices than the 25-hp units of equivalent capacity. An 80 per cent BOD reduction in the combined secondary system was achieved at a BOD load of 3.53 lbs/1,000 cu ft of aeration capacity or 2.2 lbs/hp-hr. This was equivalent to a daily BOD load of 16,000 lbs. Biological treatment of the mill waste to a BOD reduction of 80 to 85 per cent produced a waste which did not readily support slime growth when added to simulated experimental streams. Although slime growth was closely related to the amount of BOD added to the simulated streams, two to three times as much slime was produced from untreated waste than for equivalent BOD additions of treated waste. Total operating cost including interest on investment and depreciation was $169,500 per year or $4.79/ton of production. Total operating cost per pound of BOD destroyed was 3.48 cents.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 ESV

TITLE OF PROJECT: A Demonstration Plant Evaluation of Four Methods for Pulp and Paper Mill Sludge Utilization and Disposal

GRANTEE OR CONTRACTOR:
Crown Zellerbach Corporation
1 Bush Street
San Francisco, California 94119

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Camas, Washington

DESCRIPTION OF PROJECT

Award Date: April 3, 1968    Project Cost: $848,320

Completion Date: April 3, 1972    Federal Cost: $350,000

Summary:

This demonstration study is a full-scale investigation of four methods of utilization and disposal of primary sludge from a combined pulp and paper mill. The areas of investigation are: disposal by incineration, utilization as "hog-fuel" make-up in a conventional steam boiler at rates ranging between 5 and 50 per cent, use as a dried mulching material for highway slope preparation, and the evaluation of sludge as an agricultural soil conditioner.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

This sheet describes briefly a grant under Section 6 Contract, Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 14-12-162 (PPB 12040)

TITLE OF PROJECT: Plasma Arc Processing of Spent Sulfite Liquors

GRANTEE OR CONTRACTOR:
Electro-Optical Systems, Inc.
300 North Halstead St.
Pasadena, California 91107

EPA PROJECT OFFICER:
George Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Pasadena, California

DESCRIPTION OF PROJECT

Award Date: May 16, 1968
Project Cost: $49,945

Completion Date: February 1, 1969
Federal Cost: $49,945

Summary:

The basic objective of this project is to determine the technical and economic feasibility of plasma arc treatment of sulfite waste liquors.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 DYD

TITLE OF PROJECT: Evaluation and Demonstration of the Massive Lime Process for the Removal of Color from Kraft Pulp Mill Wastes

GRANTEE OR CONTRACTOR:
International Paper Company
220 East 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:
George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Springhill, Louisana

DESCRIPTION OF PROJECT

Award Date: June 14, 1968

Project Cost: $850,000

Completion Date: December 31, 1971

Federal Cost: $595,000

Summary:

International Paper Company proposes to isolate wastes from the caustic extraction stage of a Kraft pulp bleaching line and the unbleached decker of the pulp mill and to treat these wastes separately and combined for the removal of color and reduction of biochemical oxygen demand by the massive lime process over a period of 27 months.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b),
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 ENC

TITLE OF PROJECT: Chemical Coagulation Color Removal System for Kraft Mill Effluents

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>Interstate Paper Corporation<br>300 East 42nd Street<br>New York, New York 10017 | EPA PROJECT OFFICER:<br>Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street, N.E.<br>Atlanta, Georgia 30309 |

Project Site: Riceboro, Georgia

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: June 27, 1968 | Project Cost: $741,160 |
| Completion Date: December 31, 1972 | Federal Cost: $466,895 |

Summary:

This project proposes to develop, install, and demonstrate a new chemical coagulation process for removing color from Kraft pulp and paper mill effluents. The process uses a stoichiometric lime addition to the untreated wastes, prior to primary sedimentation, which adsorbs the color bodies onto the lime floc and is settled with the sludge. This sludge is then removed to lagoons for drying and storage.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 DRY

TITLE OF PROJECT: A Color Removal and Fibrous Sludge Disposal Process for the Kraft Paper Industry

GRANTEE OR CONTRACTOR:
Continental Can Company, Inc.
Paperboard and Kraft Paper Division
Hodge, Louisiana 71247

EPA PROJECT OFFICER:
Dr. Richard Hill
Region VI, EPA
1600 Patterson
Dallas, Texas 75202

Project Site: Hodge, Louisiana

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | July 25, 1968 | Project Cost: | $2,865,970 |
| Completion Date: | December 31, 1972 | Federal Cost: | $750,000 |

Summary:

This project will develop economical design and operational data applicable to the Kraft pulp and paper industry in removal of color in mill effluents and in disposal of fibrous sludges. Color removal will be accomplished by lime precipitation of the color bodies and fibers with subsequent regeneration of the lime by sludge combustion in a kiln.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 DKD

TITLE OF PROJECT: Chemical and Physical Nature of Color Bodies in Kraft Mill Effluents Before and After Treatment

GRANTEE OR CONTRACTOR:
Institute of Paper Chemistry
Appleton, Wisconsin 54911

EPA PROJECT OFFICER:
George R. Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: December 31, 1968 Project Cost: $170,721.00

Completion Date: December 31, 1971 Federal Cost: $119,504.70

Summary:

Kraft pulping wastes which are discharged into streams may darken the color of the water, contribute to the biochemical oxygen demand, and increase the solids content of the stream. New federal and state water standards will require removal of such materials from mill effluents. Lime precipitation in small-scale operations has been shown to remove certain of the solid constituents and demonstration grants on lime treatments have been approved at three Kraft mill sites.

The objective of the proposed project is to determine the chemical and physical nature of the color bodies in the effluents from these three Kraft mills, both before and after lime treatment. The investigation should lead to a better understanding of the results of the lime treatments and may suggest means for more complete removal of color.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 EJU

TITLE OF PROJECT: Production and Use of Activated Carbon for Water Renovation in Kraft Pulp and Paper Mills

GRANTEE OR CONTRACTOR:
St. Regis Paper Company
150 East 42nd Street
New York, New York 10017

EPA PROJECT OFFICER:
George R. Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Jacksonville and Pensacola, Florida
West Nyack, New York

DESCRIPTION OF PROJECT

Award Date: June 30, 1969 Project Cost: $1,461,562

Completion Date: June 30, 1972 Federal Cost: $878,472

Summary:

St. Regis Paper Company proposes a program for the development of an economical system for maximum water reuse in the Kraft pulp and paper industry as a means of water pollution control and conservation. This program is based on two concepts. The first is an effluent treatment cycle using activated carbon and the second is on-site carbon production and activation from readily available raw materials with full integration into the Kraft mill recovery and power systems to achieve the lowest net cost of activated carbon.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 FKS

TITLE OF PROJECT: Steam Stripping and Rectification of Kraft Pulp Mill Condensates and Black Liquors

GRANTEE OR CONTRACTOR:
Weyerhaeuser Company
Longview, Washington 98632

EPA PROJECT OFFICER:
H.K. Willard
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Longview, Washington

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | April 1, 1970 | Project Cost: | $183,905 |
| Completion Date: | March 31, 1972 | Federal Cost: | $128,733 |

Summary:

A pilot-plant stripping unit will be designed and built. This will be installed along with auxilliary equipment for rectification and storage. Runs will be made using decanter underflow, blow condensate, evaporator condensate, and black liquor. The stripping bottoms water will be tested and then sewered. The overhead, which forms two immiscible liquids when condensed, will be decanted, forming a crude turpentine product and a water soluble organic layer. This will be further rectified and processed to evaluate the worth of the products therein. The main objective is to determine on a large pilot-plant scale (50 gal/min. stripping unit) the efficiency and effectiveness of a steam stripping-rectification unit in reducing the volatile organic chemicals in Kraft process condensate streams. This reduction is directly proportional to the biochemical oxygen demand (BOD) reduction that can be achieved by this process. The mass transfer data provided by this stripping and rectification equipment, along with the economics of any by-products derived, is necessary for further decisions regarding full-scale units.

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 FES

TITLE OF PROJECT: Sludge Disposal and Material Recovery System for Manufacturers of Coated and/or Filled Papers

GRANTEE OR CONTRACTOR:
S.D. Warren Co.
89 Cumberland Street
Westbrook, Maine 04092

EPA PROJECT OFFICER:
Dr. Hend Gorchev
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Westbrook, Maine

DESCRIPTION OF PROJECT

Award Date: May 15, 1970 Project Cost: $65,875

Completion Date: June 30, 1971 Federal Cost: $45,058

Summary:

The objective of this project is to evaluate the effectiveness of a pyrolysis process for the recovery and subsequent reuse of pigment from the dewatered sludge of a paper mill primary waste treatment system.

The major project activities will include installation of a grit removal system, production of three tons of recovered pigment in a pilot-plant rotary kiln, quality analysis of the recovered pigments, a paper production run using the recovered pigment, and an evaluation of the effectiveness of the total process.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**

**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 FUB

TITLE OF PROJECT: Closure of Water Use Loop in NSSC Pulp and Paperboard Mill Utilizing R-O as a Unit Operation

GRANTEE OR CONTRACTOR:
Green Bay Packaging, Inc.
Post Office Box 1107
Green Bay, Wisconsin 54305

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Green Bay, Wisconsin

DESCRIPTION OF PROJECT

Award Date: June 15, 1970

Project Cost: $42,830

Completion Date: December 15, 1971

Federal Cost: $17,665

Summary:

The objective of this project is to demonstrate the full-scale mill conditions resulting from maximum closure of a pulp and paperboard mill wastewater loop. This pilot project required the development of reverse osmosis operating techniques which were applicable to this mill wastewater. Several reverse osmosis vendors operated proprietary equipment simultaneously and continuously on the same feed to determine design criteria for the full-scale production facility. The full scale demonstration is funded under project number 800520.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 FDE

TITLE OF PROJECT: Treatment Plant for Flocculation and Microscreening of Whitewater

GRANTEE OR CONTRACTOR:
Esleeck Manufacturing Company
and Strathmore Paper Company
Turner Falls, Massachusetts

EPA PROJECT OFFICER:
Edward J. Conley
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Turners Falls, Massachusetts

DESCRIPTION OF PROJECT

Award Date: June 24, 1970 Project Cost: $605,400

Completion Date: June 24, 1972 Federal Cost: $252,345

Summary:

The objective of this grant is to investigate the applicability of microscreening of paper mill wastes from two paper mills that manufacture business, technical and other papers made from either rag or chemical wood pulps to determine the removal of biochemical oxygen demand (BOD), suspended solids, color and turbidity. Tests will be run utilizing a coagulant or coagulant aid, such as a polyelectrolyte, for the further removal of turbidity from the mocroscreener effluent. Evaluations to determine the possibility of reclaiming fibers from the microscreener sludge will be done. Appropriate treatment processes, such as centrifugation or sedimentation, may enable the mills to economically recover lost fibers.

Data will be obtained to determine design factors and estimates of the cost of construction and operation of such a facility. The cost of operation will be correlated with the retail market value of the product. Also, the study will conduct tests on a ultra-filter supplied free of charge by the EPA.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 GLV

TITLE OF PROJECT: Delineation of Pulp and Paper Mill Wastes

GRANTEE OR CONTRACTOR:
WAPORA, Inc.
1725 DeSales St., N.W.
Washington, D.C.

EPA PROJECT OFFICER:
George R. Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington D.C. 20460

Project Site: Washington, D.C.

DESCRIPTION OF PROJECT

Award Date: December 30, 1970 Project Cost: $70,940

Completion Date: September 30, 1971 Federal Cost: $70,940

Summary:

The objective of this contract is to define the standard manufacturing processes (SMP) used in the industry, the standard raw waste loads (SRWL) generated (by components) per unit of raw material consumed or product produced, the base level effluent attainable on the basis of the commonly applied waste treatment technology and typical treatment efficiency, and the currently best available effluent attainable on the basis of the best demonstrated waste treatment technology. From this information criteria for determining effluent standards is to be developed.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 HAR

TITLE OF PROJECT: Delineation of Paperboard, Building Paper, and Board Mill Industry Wastes

GRANTEE OR CONTRACTOR:
WAPORA, Inc.
1725 DeSales St., N.W.
Washington, D.C.

EPA PROJECT OFFICER:
George R. Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington D.C. 20460

Project Site: Washington, D.C.

DESCRIPTION OF PROJECT

Award Date: December 30, 1970 Project Cost: $45,322

Completion Date: September 30, 1971 Federal Cost: $45,322

Summary:

The objective of this contract is to define the standard manufacturing processes (SMP) used in the industry, the standard raw waste loads (SRWL) generated (by components) per unit of raw material consumed or product produced, the base level effluent attainable on the basis of the commonly applied waste treatment technology and typical treatment efficiency, and the currently best available effluent attainable on the basis of the best demonstrated waste treatment technology. From this information criteria for determining effluent standards is to be developed.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 HDU

TITLE OF PROJECT: Mercury Recovery from Sediments and Sludges

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>Georgia-Pacific Corporation<br>P.O. Box 1236<br>Bellingham, Washington 98225 | EPA PROJECT OFFICER:<br>Ralph Scott<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Bellingham, Washington

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: June 30, 1971 | Project Cost: $506,800 |
| Completion Date: July 1, 1973 | Federal Cost: $227,620 |

Summary:

A major unsolved problem is the recovery of mercury from brine process sludge, or mercury-containing sediment, to prevent reentry of mercury into the environment following land disposal. The object of this project would be to develop, compare, select, and install such a system.

Initially, several processes for the recovery of mercury from brine process sludge will be evaluated to determine:

1. Efficiency of treatment.
2. Losses and residual mercury after treatment.
3. Susceptibility to automation.
4. Sensitivity to operating parameters.
5. Testing and control requirements.
6. Capital and operating costs.

Following approval of final design, the optimal system will be installed, debugged, and operating parameters reassessed to determine conditions of maximum efficiency. An operator instruction manual will be prepared and use-tested.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12040 GQD

TITLE OF PROJECT: Coliform Growth and Control in Aerated Stabilization Basins

GRANTEE OR CONTRACTOR:
Crown Zellerbach Corporation
#1 Bush Street
San Francisco, California 94119

EPA PROJECT OFFICER:
Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Lebanon, Oregon

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | July 1, 1971 | Project Cost: | $201,877 |
| Completion Date: | December 31, 1972 | Federal Cost: | $95,568 |

Summary:

Crown Zellerbach Corporation, together with the Oregon State Department of Environmental Quality and the Pacific Northwest Water Laboratory of EPA, will study the growth and control of coliform organisms in a full (total mill effluent) scale aerated stabilization basin treating weak sulfite waste liquor and paper machine "whitewaters." Production and treatment system manipulations, together with treated effluent disinfection by various agents, will be utilized to obtain the highest possible BOD removal and the lowest levels of coliform growth rate and densities.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12040 HPK

TITLE OF PROJECT: "Organic Compounds in Pulp Mill Lagoon Discharge"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| University of Washington<br>Seattle, Washington 98105 | Dr. Larry Keith<br>Southeast Water Laboratory<br>College Station Rd.<br>Athens, Georgia 30601 |

Project Site: Seattle, Washington 98105

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | September 1, 1971 | Project Cost: | $35,302 |
| Completion Date: | August 31, 1972 | Federal Cost: | $31,772 |

Summary:

This project will qualitatively identify and quantitatively measure the organic compounds entering and leaving Kraft pulp mill aerated lagoons. Waste water samples will be collected from both Kraft bleached and unbleached processes and analyzed by a gas chromatographmass spectrometer, thin layer chromatography, carbon adsorption, IR, UV, NMR and total organic carbon analysis. The effect of wood species and biological treatment on chemical compounds will be studied to determine which compounds are destroyed and which are either produced or unchanges in the treatment process. The origin of unchanged components in the process will be determined with the aim of defining possible control points within the process.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6(b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S 800261

TITLE OF PROJECT: "Ultrafiltration Processes for Color Removal from Kraft Mill Effluents"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Champion Papers Division of U.S. Plywood-Champion Papers Inc.<br>Knightsbridge Drive<br>Hamilton, Ohio 45020 | Mr. Edmond Lomasney<br>EPA Region IV<br>Atlanta, Georgia 30309 |

Project Site: Canton, North Carolina

DESCRIPTION OF PROJECT

Award Date: February 1, 1972

Project Cost: $152,155

Completion Date: January 31, 1973

Federal Cost: $ 99,096

Summary:

This project will determine the technical feasibility and economic attractiveness of the ultrafiltration process for color removal from first stage caustic extraction filtrate generated in the bleaching of Kraft wood pulp. Treatment of decker effluent, the second most important source of color in the mill effluent, will also be included. Another important objective of the project will be to demonstrate the potential of the treated effluent for reuse within the mill. Phase I of the project will involve on-site operation of a 10,000 gpd membrane unit. Information will also be used to develop design criteria for a full scale demonstration plant, Phase II. Additional studies will determine requirements for feed filtration prior to ultrafiltration and incineration of the final concentrate produced by ultrafiltration.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S 800853

TITLE OF PROJECT: "Chemical and Physical Nature of Color Bodies in Kraft Mill Effluents Before and After Lime Treatment"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Institute of Paper Chemistry<br>Appleton, Wisconsin 54911 | Dr. James D. Gallup<br>Paper and Food Products Industries Sec.<br>Office of Research and Monitoring<br>Washington, D.C. 20460 |

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | Jan. 1, 1972 | Project Cost: | $142,177 |
| Completion Date: | June 30, 1972 | Federal Cost: | $ 99,524 |

Summary:

Effluents from Kraft pulping operations darken the color of the receiving stream, contribute to its biochemical oxygen demand, and increase the solids content of the stream. New Federal and State water standards will require removal of such materials from mill effluents. Demonstration grants on lime treatments at three Kraft mill sites have shown that lime precipitation removes certain of the solid constitutents.

The objectives of this continued project are to determine the chemical and physical nature of color bodies which are not removed by massive and stoichiometric lime treatments, to establish conditions for improved lime treatments, and to evaluate and optimize treatment combinations to obtain a product water suitable for reuse. This investigation should provide quantitative data to fully evaluate the effects and advantages of stoiciometric lime treatment, massive lime treatment and improved lime treatment techniques.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) ,
*Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: S 801207

TITLE OF PROJECT: "Treatment of Sulfite Evaporator Condensates for Recovery of Volatile Components"

GRANTEE OR CONTRACTOR:
The Institute of Paper Chemistry
P.O. Box 1048
Appleton, Wisconsin 54911

EPA PROJECT OFFICER:
Dr. James D. Gallup
Environmental Protection Agency
Xerox Building
1901 Ft. Myer Drive
Washington, D.C. 20460

Project Site: Appleton, Wisconsin

DESCRIPTION OF PROJECT

Award Date: May 1, 1972 Project Cost: $150,000

Completion Date: April 30, 1973 Federal Cost: $ 40,000

Summary:

The primary objective of this twelve month program is to evaluate a proposed steam stripping and activated carbon process to remove BOD causing volatiles from sulfite pulp liquor evaporation condensates. Studies will also be directed toward determining the economic feasibility of a full scale installation with due consideration provided the economic return from by-product recovery. The result of the successful application of this process will produce commercial values of mythyl and thyl alcohol, ethyl acetate, and furfural. The process will also produce high grade water suitable for recycle or boiler water, and control in-plant of a major fraction of BOD causing organics now escaping in the form of condensates from the efforts at recovery of spent sulfite pulping liquors.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S800740

TITLE OF PROJECT: Minimizing the Pollutional Impact of Kraft Pulping Through Oxygen Bleaching

GRANTEE OR CONTRACTOR:
The Chesapeake Corporation
of Virginia
West Point, Virginia 23181

EPA PROJECT OFFICER:
Dr. James D. Gallup
Paper & Food Products Industries Section
Office of Research & Monitoring
Washington, D.C. 20460

Project Site: West Point, Virginia

DESCRIPTION OF PROJECT

Award Date: March 1, 1972
Project Cost: $12,160,000

Completion Date: February 5, 1975
Federal Cost: $438,938

Summary:

This project will demonstrate the practicality of operating a 300 ton per day three or four stage oxygen bleaching system for producing hardwood Kraft pulp. The application of molecular oxygen to other unit processes including oxygen oxidation of black liquor will be investigated throughout the mill. In addition to being the first demonstration of oxygen bleaching in North America, the project will also be the first application of oxygen technology to be integrated into an entire mill system. The overall result of the project will be a bleached Kraft effluent with significant reductions in organics, both BOD and color, and inorganics, particularly chlorides.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800520

TITLE OF PROJECT: "Closed Process Water-Loop in NSSC Pulp Production"

GRANTEE OR CONTRACTOR:
Green Bay Packaging Inc.
P.O. Box 1107
Green Bay, Wisconsin 54305

EPA PROJECT OFFICER:
Ralph H. Scott
EPA - Pacific Northwest Water Laboratory
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Green Bay, Wisconsin

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | March 1, 1972 | Project Cost: | $626,820 |
| Completion Date: | Nov. 30, 1974 | Federal Cost: | $300,430 |

Summary:

The primary objective of this project is to achieve the maximum closure of the process water-loop in an integrated neutral sulfite semichemical (NSSC) pulp and paperboard mill. Contaiminated process water will be recycled for direct reuse. Excess surge volumes occurring during process upsets will be processed in a reverse osmosis plant to separate dissolved constituents from the process water. This permeate will be recycled and the separated solids will be destroyed in the fluid bed combustion system. Another objective of the project is to demonstrate the techniques required to stabilize operations and control ambient conditions in a tightly closed NSSC system.

The result of this project will be the first detailed description of activities required to accomplish a closed process water-loop in a NSSC pulp and paperboard mill.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S 801206

TITLE OF PROJECT: "Water Reuse in a Paper Reprocessing Plant"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Big Chief Roofing Company<br>P. O. Box 908<br>Ardmore, Oklahoma 73401 | Mr. James Gallup<br>EPA<br>Washington, D.C. |

Project Site: Ardmore, Oklahoma

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: | Project Cost: $120,709 |
| Completion Date: | Federal Cost: $ 45,063 |

Summary:

This project is concerned with the treatment of paper reprocessing waste water in a facility designed for water reuse. Economic feasibility of waste water recycle and various treatment alternatives are determined from laboratory and full scale tests. Studies will determine the effect of recycle on product quality; predict increases in operating costs resulting from increased corrosion rates, scale formation, clime growths and deposits; determine savings from decreased waste treatment costs; fiber losses, and water use; and determine increases in chemical costs for slime control and corrosion inhibition.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# PPB 12050

# PETROLEUM AND COAL PRODUCTS

The petroleum refining industry is by far the largest water user in this subprogram element. The industry uses 20 billion gallons of water per day or 20 per cent of total industrial water usage. Approximately 0.25 billion gallons per day are used in processing operations. Many distinct operations such as crude oil distillation, reforming, catalylic cracking, thermal cracking, polymerization, alkalation, gasoline and middle distillate treating, motor oil manufacturing, etc. are utilized. Foul condensate is usually pretreated at the source but, for the most part, refiners depend on central waste treatment facilities for pollution control. Oil separation and recovery, followed by biological conversion of phenols, sulfides, etc., are the treatment techniques most frequently employed. Greater emphasis on more effective treatment, waste treatment at the source, product recovery, water reuse, and development of treatment methods requiring less land areas is needed. The map on p. 6-7 indicates the major areas of petroleum refining activity in the United States.

Over 500 million tons per year of coal are obtained by strip and deep mining operations in the United States. Approximately one-half of this output is consumed by the utility and steel industries. Over 80 per cent of the coal is cleaned and classified by using water as the cleaning medium prior to marketing. Among the most troublesome wastes from coal processing and use are coal fines, sulfur dioxide, phenols, ammonia, and thermally polluted waters. For EPA R&M Program administration purposes, mine drainage problems are assigned to subprogram PPB 1401 Mine Drainage, thermal pollution problems are assigned to PPB 1603 Thermal Pollution, and wastes from coal-coking operations are assigned to PPB 1201 Metal and Metal Products since the majority of coal coking is accomplished as an integral part of steel mill operations. The map on p. 6-8 indicates the location of coal tar products plants in the United States.

## PROJECT INDEX

## PPB 12050 - PETROLEUM AND COAL PRODUCTS

| 12050 | Grantee or Contractor | Project Status* | Page |
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| DIT | Texas A&M Research Foundation | D | 6-9 |
| DKF | University of Oklahoma Research Institute | B | 6-10 |
| DXR | Harvard University | D | 6-11 |
| DRC | Illinois Institute of Technology | A | 6-12 |
| EKT | American Oil Company | A | 6-13 |
| DSH | American Petroleum Institute | A | 6-14 |
| DML | American Oil Company | C | 6-15 |
| EZG | Shell Oil Company | B | 6-17 |
| GQR | American Oil Company | C | 6-18 |
| GTR | Atlantic Richfield Company | C | 6-19 |
| GXF | B.P. Oil Corporation | C | 6-20 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

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## FINAL REPORTS AVAILABLE

### PPB 12050 - Petroleum and Coal Products

| Report Number | Title/Author | Source |
|---|---|---|
| 12050 DSH 03/71 | The Impact of Oily Materials on Activated Sludge Systems, Hydroscience, Inc., Westwood, New Jersey. | GPO - $1.25 |
| 12050 EKT 03/71 | Fluid-Bed Incineration of Petroleum Refinery Wastes, American Oil Company, Mandan, North Dakota. | GPO - $1.50 |
| 12050 DRC 11/71 | Experimental Evaluation of Fibrous Bed Coaleascers for Separating Oil-Water Emulsions, Department of Chemical Engineering, Illinois Institute of Technology, Chicago, Illinois. | GPO - $1.75 |

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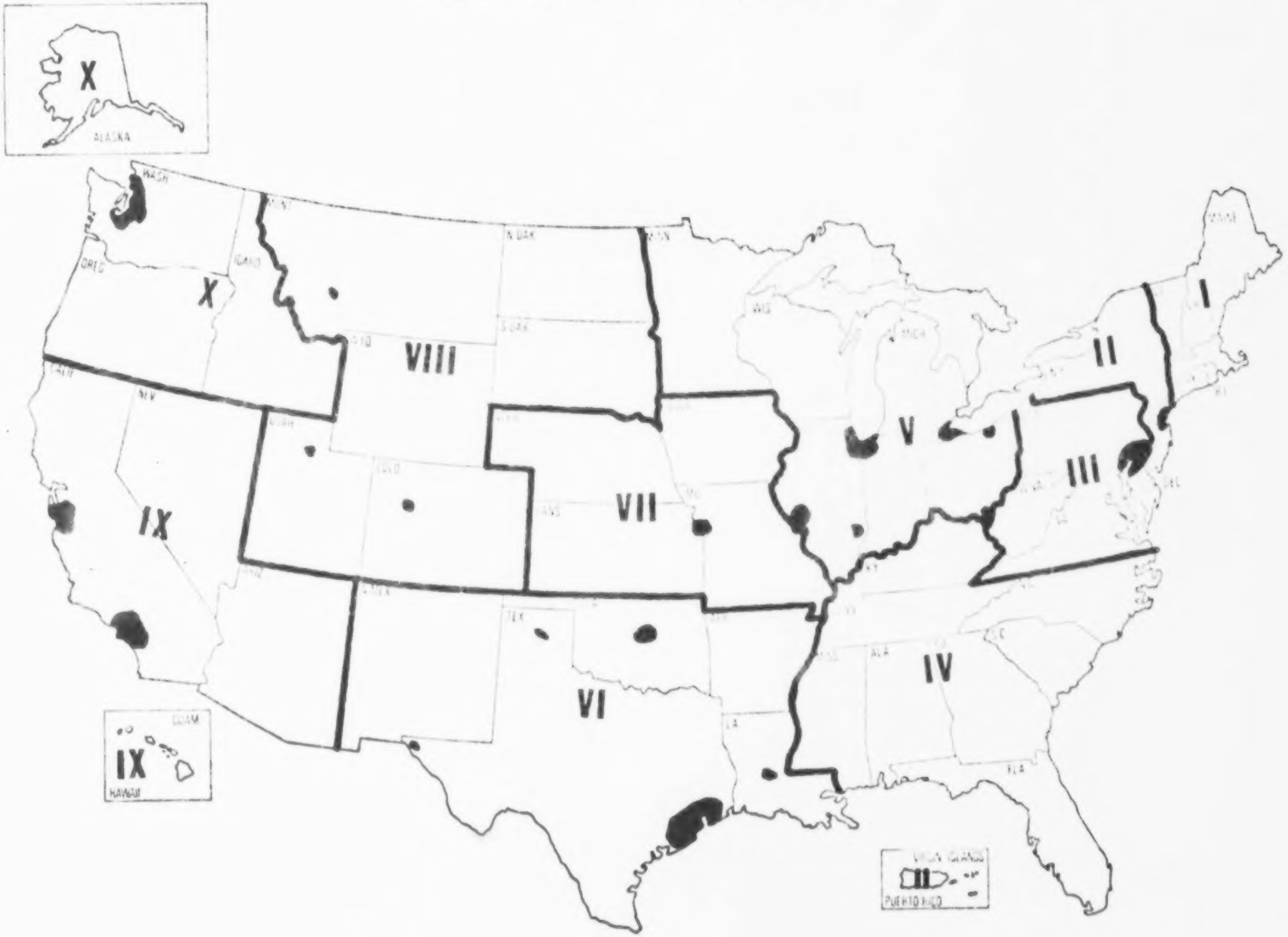
LOCATION OF MAJOR PETROLEUM REFINERIES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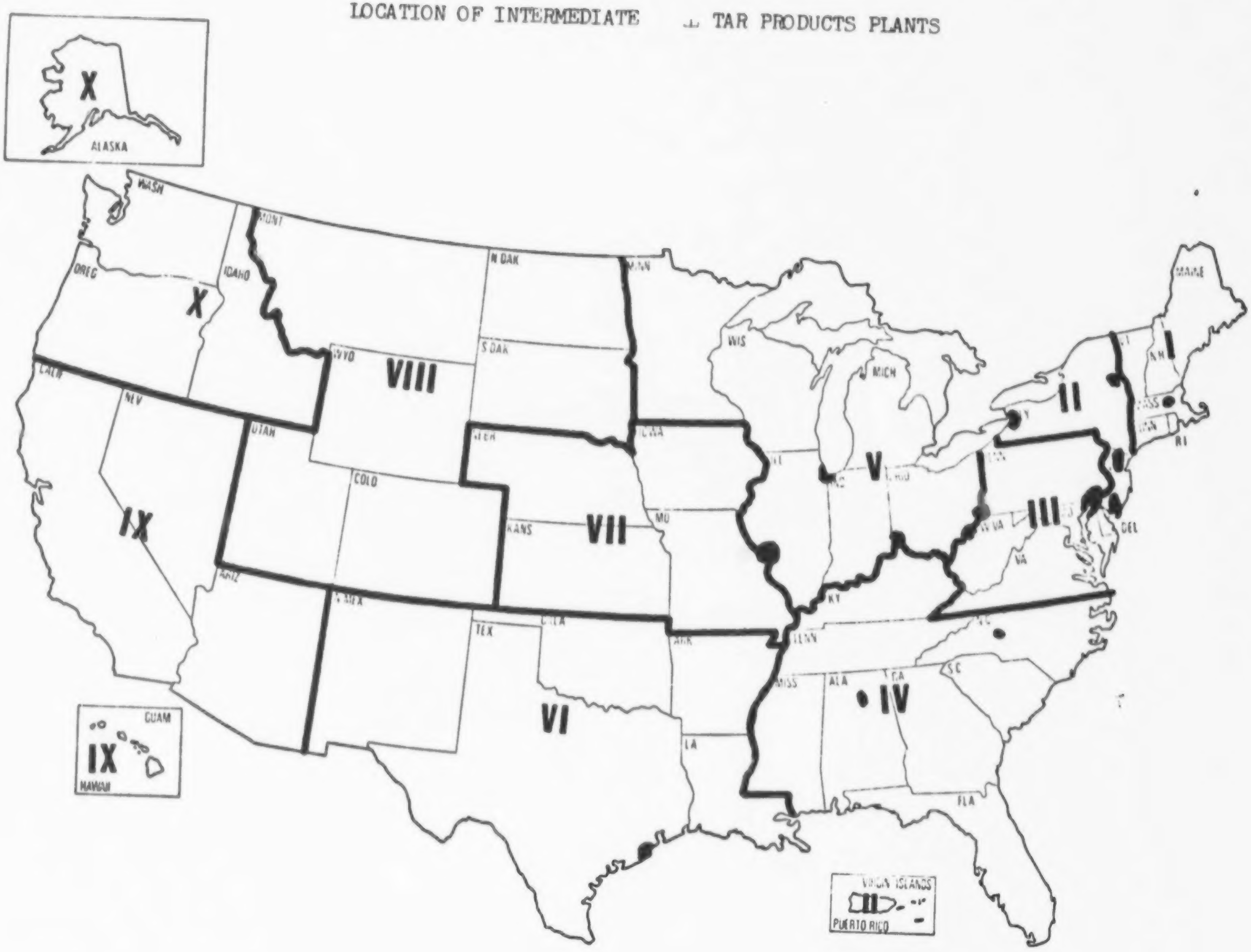
LOCATION OF INTERMEDIATE TAR PRODUCTS PLANTS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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 DIT

TITLE OF PROJECT: Metal Ion-Catalyzed Oxidation of Phenols and Aromatic Amines

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Texas A&M Research Foundation | George Rey<br>Industrial Pollution Control Branch<br>Water Quality Research, EPA<br>Washington, D.C. 20242 |

Project Site: Texas A&M

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | September 1, 1967 | Project Cost: | $234,000 |
| Completion Date: | August 31, 1972 | Federal Cost: | $40,265 |

Summary:

A study of the mechanism and feasibility of the metal ion-catalyzed oxidation of phenols and aromatic amines by molecular oxygen in wastewater systems partially treated with potassium permanganate was undertaken in this project.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 DKF

TITLE OF PROJECT: State-of-the-Art Evaluation on Petroleum and Coal Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| University of Oklahoma Research Institute<br>1808 Newton Drive<br>Norman, Oklahoma 73069 | Leon Myers<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: Norman, Oklahoma

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | October 15, 1968 | Project Cost: | $17,897 |
| Completion Date: | April 15, 1970 | Federal Cost: | $14,297 |

Summary:

The final report to this study presents a state-of-the-art evaluation of pollution problems, abatement procedures, and control techniques relevant to the petroleum and coal industries. Petroleum wastes are discussed under three broad sections: drilling-production, transportation and storage, and refining. The results of a field study of three small refineries are reported, providing additional information which delineates the characteristics of waste streams from individual processes withing the refinery.

Coal mining, coal processing, and coal utilization, the wastes associated with each, and the corresponding control measures are discussed. Acid mine drainage, the most significant pollution problem from coal mining, and possible control measures are presented. The major pollution problems associated with coal processing originate from coal cleaning, the coking process, and refuse disposal. The principal pollutants in water discharged from the processing of coal are suspended solids usually in the form of fine clay, black shale, and other minerals commonly associated with coal. The production of coke by carbonization of coal produces a wastewater that is high in phenols, ammonia, and dissolved organics.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 DXR

TITLE OF PROJECT: Oil Dispersion Coalescence by Porous Solid Contact

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| President & Fellows of Harvard College<br>Office of Research Contracts<br>1350 Massachusetts Avenue<br>Cambridge, Massachusetts 02138 | Richard Keppler<br>Region I, EPA<br>John F. Kennedy Fed. Bldg. Rm. 2303<br>Boston, Massachusetts 02203 |

Project Site: Cambridge, Massachusetts

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: February 1, 1970 | Project Cost: $16,157 |
| Completion Date: July 31, 1971 | Federal Cost: $15,349 |

Summary:

The first year-report describes progress toward completion of a laboratory experimental and theoretical investigation of oil dispersion separation by filtration through packed beds. The end results of this study should be important to process design for treatment of waste aqueous oil dispersions such as those produced in industrial processing and ship ballast discharge.

Equations which define relevant measurables are presented. These equations should permit scaling to practical conditions from small-scale studies.

An apparatus for measuring the coefficients characterizing oil drop capture and flow pressure drops has been constructed. Though the test section works, this device needs modification to incorporate x-ray absorption to monitor in situ the held-up oil as well as an oil homogenizer for continual dispersal and recirculation before extensive measurements can be made. A separate apparatus for measuring capillary pressure is now operative.

Computer calculations of filter coefficients for initial drop capture are presented. These should be useful for eventual data correlation.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 DRC

TITLE OF PROJECT: Efficiency of Fibrous Bed Coalescers

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Chemical Engineering<br>Illinois Institute of Technology<br>Chicago, Illinois 60616 | Clifford Risley<br>Region V, EPA<br>1 North Wacker Drive<br>Chicago, Illinois 60606 |

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: June 1, 1970 | Project Cost: $41,665.00 (2nd year) |
| Completion Date: June 1, 1971 | Federal Cost: $34,998.60 (2nd year) |

Summary:

A 1 sq. ft. coalescer unit using filter press construction has been designed for removing dispersed oil from water and has been tested on both a synthetic stream and an actual pollutant stream. The oil removal efficiency was essentially 100 per cent at a superficial velocity of 1 fpm. The present design is suitable for large-scale operation by the use of both multiple cells and larger individual cells.

The performance of fiber glass coalescers was studied in depth using a cell with an active area of 1.77 sq. in. The commercial fibers, with phenol formaldehyde coatings and a fiber diameter of $3.2\mu$, gave efficiencies of 90-99 per cent with bed densities of 12 lb./ft.$^3$ when operating at superficial velocities from 0.2 to 4 fpm on emulsions containing 50-500 ppm of oil. In all cases the pressure drop increased continually with run time due to both accumulation of oil in the bed and mechanical degradation of the fibers. Preliminary tests indicated that the bed degradation phenomenon could be eliminated by structurally stabilizing the compressed fibers with methacrylate resin.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 EKT

TITLE OF PROJECT: Fluid Bed Incineration of Petroleum Refinery Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| American Oil Company<br>910 S. Michigan Avenue<br>Chicago, Illinois 60680 | Otmar Olson<br>Region VII, EPA<br>911 Walnut Street<br>Kansas City, Missouri 64106 |

Project Site: Mandan, North Dakota

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | February 1, 1968 | Project Cost: | $354,530 |
| Completion Date: | December 1, 1970 | Federal Cost: | $170,265 |

Summary:

The applicability of the fluid bed incineration process for the disposal of petroleum refinery generated spent caustic and oily sludge in a commercial-scale unit has been demonstrated under this project. Operating problems have been studied. Design and operating procedural changes are suggested in the final report.

The major process limitation stems from the loss of bed fluidity due to high particle size growth rate. Particle size growth rate is directly proportional to the particle diameter and rate of dissolved solid material charged and inversely proportional to the mass of material in the bed. The average particle diameter can be controlled by (1) collecting and continuously returning fine material to the bed, (2) utilizing an effective attriting system, and (3) limiting superficial space velocity to avoid elutriation of fines.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 DSH

TITLE OF PROJECT: Improved Capabilities of Biological Systems to Assimilate Oil

GRANTEE OR CONTRACTOR:
American Petroleum Institute
Air and Water Conservation
1801 K Street, N.W.
Washington, D.C. 20006

EPA PROJECT OFFICER:
Paul Lefcourt
Hudson-Delaware Basins Office, EPA
Edison, New Jersey 08817

Project Site: New York, New York

DESCRIPTION OF PROJECT

Award Date: June 20, 1968
Project Cost: $84,990

Completion Date: December 1, 1969
Federal Cost: $51,470

Summary:

Small-scale, continuous activated sludge systems were exposed to a variety of oily compounds at several loading levels and the system performance was observed Batch studies to determine the biodegradability of the oily compounds, and the effects of emulsification and temperature on the rate of biological reaction were also conducted.

As a result of this study, it was found that oils introduced into an activated sludge system are absorbed on the floc and are very slowly degraded. If the loading rate is higher than the degradation rate or the rate of wastage, the oil accumulates on the sludge. The accumulation causes a loss of density and then a loss of acceptable sludge settling characteristics. The biological system fails due to the loss of floc, but it is important to note that the ability of the biological system to remove other substrates is not inhibited by the presence of oil compounds until excessive loss of MLSS has occurred. The continuous feed level of oils to activated sludge should not exceed 0.10 pounds per day per pound of sludge under aeration. Shock loads should not exceed 5 per cent of the weight of the sludge under aeration.

The study also considered separation of oils before biological treatment and various chemical methods of handling complex cases.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) .
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 DML

TITLE OF PROJECT: Treatment of Refinery Effluent by a Unique Combination of Biological and Chemical Processes

GRANTEE OR CONTRACTOR:
American Oil Company
910 South Michigan Avenue
Chicago, Illinois

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Whiting, Indiana

DESCRIPTION OF PROJECT

Award Date: February 19, 1969

Project Cost: $1,737,775

Completion Date: August 31, 1971

Federal Cost: $336,535

Summary:

A 30-mgd scale project to demonstrate the advantages of using chemical coagulation and air flotation following biological conditioning to provide refinery effluent of high quality will be undertaken to establish what operating flexibilities exist in such a combination of processes and the costs associated therewith. Evaluation of a number of unique design features, including a hitherto unproven process for disposal of oily sludges, a unique and low-cost method for preventing sludge deposition in an aerated lagoon, a novel application of rotary-drum skimmers and a comparative study of alternate design features for air flotation, will be also made.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 EZG

TITLE OF PROJECT: Demonstration of Oily Waste Disposal by Soil Cultivation Process

GRANTEE OR CONTRACTOR:
Shell Oil Company
P.O. Box 100
Deer Park, Texas 77536

EPA PROJECT OFFICER:
Leon Myers
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Deer Park, Texas

DESCRIPTION OF PROJECT

Award Date: March 18, 1970
Project Cost: $100,000

Completion Date: January 17, 1972
Federal Cost: $70,000

Summary:

The project will consist of a series of experiments on the treatment of oily sludges (crude tank bottoms, Bunker C, intermediate wax oils) by spreading and cultivation into soil under prevailing climatic conditions. Nine test plots will be operated at specific nutrient addition levels. The objectives will be to determine:

1. Decomposition rates of various types of oily waste sludges.
2. Effectiveness of adding nutrient supplements.
3. Major microbiological species active in the soil.
4. Cost of the process for the disposal of oily waste.
5. Depth of oil penetration into the soil.

The demonstration phase will follow a six-month pilot phase for optimization of waste loading rates and nutrient addition.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 GQR

TITLE OF PROJECT: Final Purification of Aerated Lagoon Effluent by Chemical Coagulation - Mixed Media Filtration

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| American Oil Company<br>910 S. Michigan Avenue<br>Chicago, Illinois 60680 | Leon Myers<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: Yorktown, Virginia

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 1, 1971 | Project Cost: $225,750 |
| Completion Date: June 1, 1972 | Federal Cost: $73,815 |

## Summary:

The project is for the full-scale (1.5 mgd) treatment of the petroleum refinery's aerated lagoon effluent. The chemical coagulation mixed media filter system will perform as a polishing facility for final clarification and purification to produce a consistent water quality effluent with the normal expectations of tertiary treatment.

The work encompasses six major efforts summarized as:

1. Design and construction.
2. Process demonstration.
3. Determination of process efficiency and phase separation costs.
4. Economic comparison with air flotation.
5. Establishment of process reliability.
6. Determination of capital and operating costs for full-scale treatment.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 GTR

TITLE OF PROJECT: Refinery Effluent Water Treatment Plant (Calgon Filtrasorb System)

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Atlantic Richfield Company<br>260 Broad Street<br>Philadelphia, Pennsylvania 19101 | Leon Myers<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: Wilmington, California

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 1, 1971 | Project Cost: $1,159,584 |
| Completion Date: January 5, 1973 | Federal Cost: $274,719 |

Summary:

This project will demonstrate and evaluate the effectiveness and economics of a non-biological system (activated carbon) for periodic treatment of refinery process and storm water runoff. The system is designed to relieve the hydraulic and waste loading of a municipal system, normally used for joint treatment during dry weather conditions, during peak flow storm periods.

The system is a parallel downflow granular activated carbon system, including carbon regenerations designed to directly treat 4.2 mgd of wastewater, reducing the chemical oxygen demand over 90 per cent to an effluent value less than 40 mg/l. In addition the effluent water quality resulting will be in compliance with the effluent quality regulations imposed by the California Water Quality Board for the Dominguez Channel.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12050 GXF

TITLE OF PROJECT: Treatment of Oil Refinery Wastewaters for Reuse Using a Sand Filter-Activated Carbon System

GRANTEE OR CONTRACTOR:
B.P. Oil Corporation
P.O. Box 428
Marcus Hook, Pennsylvania 19061

EPA PROJECT OFFICER:
Leon Myers
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Marcus Hook, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: July 1, 1971 Project Cost: $2,625,240

Completion Date: July 1, 1974 Federal Cost: $350,000

Summary:

Project objectives include:

1. Demonstration of the unique application of sand filtration followed by activated carbon adsorption for total treatment of refinery wastewaters.
2. Demonstration of the use of two-stage centrifugation for sludge dewatering and oil recovery from the centrate.
3. Investigation of the practicality of the reuse of treated effluent within the refinery.
4. Collection of reliable operating data from full-scale facilities including capital and operating costs of treatment facilities.
5. Investigation of the reuse of treated effluent for cooling tower and boiler feed water makeup.

The project plan will be to design, construct, and operate a refinery wastewater treatment facilities consisting of sand filtration and activated carbon adsorption. The design is to be based on information gathered during prior pilot-scale evaluation of sand filter-activated carbon system. The project will demonstrate the feasibility of use of sand filter-activated carbon system for treatment of refinery wastewaters as an alternate to the conventional biological treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# PPB 12060

## FOOD AND KINDRED PRODUCTS

Activities under this subprogram element encompass those industries dealing with the processing of products for ultimate human or animal consumption. It is estimated that the wastes generated by this industry, comprising some 32,000 related companies, represent 21 per cent of the total national manufacturing pollutional load. The industry has been broken down into sub-categories along the guidelines of the Standard Industrial Classification (SIC) Manual. These encompassed categories include: (1) Meat products, (2) Dairy products, (3) Canned and frozen foods, (4) Grain mill products, (5) Bakery products, (6) Sugar, (7) Beverage industries (non-alcoholic), (8) Candy and related products, and (9) Miscellaneous foods and kindred products (coffee, edible oils, animal fats and oils, etc.).

The diversity in processing operation, volume, and the seasonal nature of this grouping causes extreme variation in $BOD_5$, COD, suspended and dissolved solids, pH, etc. in the resultant organic waste streams. The geographical expanse and systems dissimilarity of this program element is partially indicated by the attached national map.

The program's goal is to assist the various sub-industries in the development of design, operational, and economic technology to create novel or improved pollution abatement systems. This program mission, of a closed-loop industrial system, will be met by the proper combination of in-plant water conservation, pretreatment, and chemical, physical, and biological wastewater management systems. This would ultimately result in the total process water reuse and in-plant recovery of valuable products (or by-products).

There are 33 grants presently ongoing with 25 projects completed with final reports issued. Through FY 72 the total of EPA funding was $8.0 million in the total project costs of $21.0 million.

## PROJECT INDEX

## PPB 12060 - FOOD AND KINDRED PRODUCTS

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| WPD 93 | Beet Sugar Development Foundation | B | 7-11 |
| WP 1486 | University of Washington | A | 7-12 |
| FDR | University of Puerto Rico | D | 7-13 |
| DSI | Beet Sugar Development Foundation | A | 7-14 |
| EHS | Melbourne Water Science Institute | B | 7-15 |
| EDK | National Canners Association Research Foundation | A | 7-16 |
| ECF | Oregon State University | A | 7-17 |
| EGU | Ohio State University Research Foundation | A | 7-18 |
| FQE | National Canners Association | A | 7-19 |
| FTC | Resource Engineering Associates | B | 7-20 |
| WPRD 38 | Minute Maid Company | A | 7-21 |
| EUB | John Morrell and Company | B | 7-22 |
| FAK | Beet Sugar Development Foundation | B | 7-23 |
| EZP | FMC Corporation | A | 7-24 |
| FAD | Snokist Growers | A | 7-25 |
| EHV | The R.T. French Company | A | 7-26 |
| EHT | North Star Research and Development Institute | A | 7-27 |
| EZY | Winter Garden Citrus Products Cooperative | A | 7-28 |
| EHU | National Canners Association Research Foundation | A | 7-29 |
| WPRD 3 | RAI Research Corporation | B | 7-30 |
| WPRD 151 | National Canners Association Research Foundation | A | 7-31 |

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| 12060 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| DQV | Swift and Company | B | 7-32 |
| DPE | Corn Products Company | C | 7-33 |
| DSB | University of Oklahoma Research Institute | A | 7-34 |
| DFF | Farmbest, Inc. | B | 7-35 |
| DEQ | Dairy Research and Development Corporation | C | 7-36 |
| EAE | National Canners Association Research Foundation | B | 7-37 |
| DXF | Crowley's Milk Company, Inc. (Phase I A) | C | 7-38 |
| EDZ | Green Giant Company | B | 7-39 |
| EGV | Gold Kist Poultry Division | B | 7-40 |
| EIG | Western Potato Service, Inc. | B | 7-41 |
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| EOF | Illinois Packing Company | D | 7-43 |
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| DXL | National Canners Association Research Foundation | B | 7-45 |
| EUZ | Widmer's Wine Cellars, Inc. | B | 7-46 |
| FJK | Ebinger Baking Company | D | 7-47 |
| FMF | Iowa Beef Packers, Inc. | C | 7-48 |
| FLL | American Distilling Company | C | 7-49 |
| FRW | Tabor City Foods, Inc. | C | 7-50 |
| FUR | Central Soya Company, Inc. | C | 7-51 |
| GPP | W.E. Reeves Packinghouse | C | 7-52 |
| ESC | American Crystal Sugar Company | C | 7-53 |
| FYG | Maryland State Department of Health | C | 7-54 |
| HFY | Del Monte Corporation | A | 7-55 |

| 12060 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| PAV | National Canners Association Research Foundation | B | 7-56 |
| HRR | Amber Labs Div., Milbrew, Inc. | B | 7-57 |
| 800747<br>HCW | Anheuser Busch Inc. | C | 7-58 |
| HPC | California Department of Agriculture, Wine Advisory Board | C | 7-59 |
| HVQ | Oklahoma State University | C | 7-60 |
| 801007 | Oregon State University | C | 7-61 |
| 800904 | American Shrimp Canners Association | C | 7-62 |
| 800250 | National Canners Association Research Foundation | C | 7-63 |
| 800930 | Pacific Egg and Poultry Association | C | 7-64 |
| S800935 | Bacardi Corporation | C | 7-65 |
| FDK | Archer Daniels Midland Company | B | 7-66 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

FINAL REPORTS AVAILABLE

PPB 12060 - FOOD AND KINDRED PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12060 --- 03/68 | Aerated Lagoon Treatment of Food Processing Wastes, Kenneth A. Dostal, Pacific Northwest Water Laboratory, EPA, Corvallis, Oregon. | GPO - 55¢ |
| 12060 --- 07/69 | Secondary Treatment of Potato Processing Wastes, Kenneth A Dostal, Pacific Northwest Water Laboratory, EPA, Corvallis, Oregon. | GPO - 65¢ |
| 12060 --- 10/69 | Current Practice in Potato Processing Waste Treatment, University of Washington, Seattle, Washington. | GPO - $1.00 |
| 12060 FAD 10/69 | Aerobic Treatment of Fruit Processing Wastes, Snokist Growers, Yakima, Washington. | NTIS<br>PB 188 506 |
| 12060 DXL 01/70 | Reduction of Salt Content of Food Processing Liquid Waste Effluent, National Canners Association, Berkeley, California. | GPO - 55¢ |
| 12060 --- 04/70 | Proceedings: First National Symposium on Food Processing Wastes, FWQA, USDA, National Canners Association, and Northwest Food Processors Association. | GPO - $3.00 |
| 12060 ECF 04/70 | Current Practice in Seafoods Processing Waste Treatment, Oregon State University, Corvallis, Oregon. | NTIS<br>PB 202 232 |
| 12060 EHT 07/70 | Use of Fungi Imperfecti in Waste Control, North Star Research and Development Institute, Minneapolis, Minnesota. | GPO - $1.00 |
| 12060 --- 08/70 | Waste Reduction in Food Canning Operations, National Canners Association, Berkeley, California. | GPO - $1.00 |
| 12060 EZP 09/70 | Cannery Waste Treatment Kehr Activated Sludge, FMC Corporation, Santa Clara, California. | GPO - 70¢ |

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## FINAL REPORTS AVAILABLE

## PPB 12060 - FOOD AND KINDRED PRODUCTS

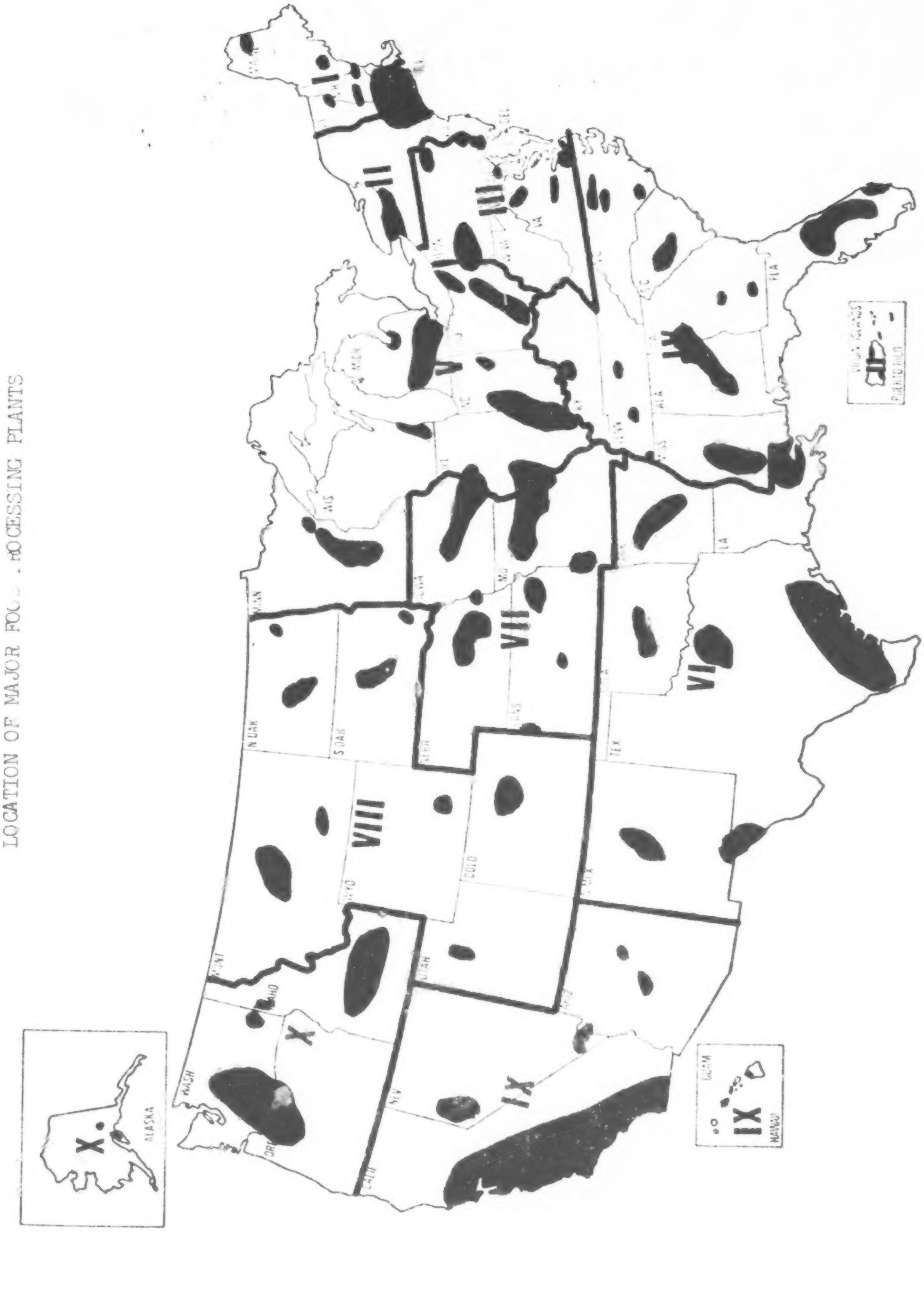
| Report Number | Title/Author | Source |
|---|---|---|
| 12060 --- 10/70 | Treatment of Citrus Processing Wastes, The Coca-Cola Company - Foods Division, Orlando, Florida. | GPO -$2.75 |
| 12060 EHV 12/70 | Aerobic Secondary Treatment of Potato Processing Wastes, R.T. French Company, Shelly, Idaho. | GPO - $1.50 |
| 12060 FQE 12/70 | Dry Caustic Peeling of Tree Fruit for Liquid Waste Reduction, National Canners Association, Berkeley, California. | GPO - 60¢ |
| 12060 --- 03/71 | Proceedings: Second National Symposium on Food Processing Wastes, EPA, Pacific Northwest Water Laboratory and National Canners Association. | GPO - $4.50 |
| 12060 EHU 03/71 | Reconditioning of Food Processing Brines, National Canners Association, Berkeley, California. | GPO - 75¢ |
| 12060 DSI 07/71 | State-of-the-Art, Sugarbeet Processing Treatment; by Beet Sugar Development Foundation, Ft. Collins, Colorado | GPO - $1.25 |
| 12060 DXF 07/71 | Membrane Processing of Cottage Cheese Whey for Pollution Abatement, Crowley's Milk Company, Binghamton, New York | GPO - $1.25 |
| 12060 EDK 08/71 | Liquid Wastes from Canning and Freezing Fruits and Vegetables; by National Canners Asso., Berkeley, California. | GPO - $1.50 |
| 12060 EDZ 08/71 | Pilot Plant Installation for Fungal Treatment of Vegetable Canning Wastes; by The Green Giant Co., Le Suer, Minnesota | GPO - $1.00 |
| 12060 EZY 08/71 | Complete Mix Activated Sludge Treatment of Citrus Process Wastes, Winter Garden Citrus Products Cooperative, Winter Garden, Florida. | GPO - $1.25 |
| 12060 EAE 09/71 | Trickling Filter Treatment of Fruit Processing Waste Waters, National Canners Association, Berkeley, Cal. | GPO - 50c |

## FINAL REPORTS AVAILABLE

### PPB 12060 - FOOD AND KINDRED PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12060 DSB 09/71 | Demonstration of a Full-Scale Waste Treatment System for a Cannery, L. E. Streebin, B. W. Reid and A. C. H. Hu, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, Oklahoma | GPO - $1.50 |
| 12060 EAE 09/71 | Trickling Filter Treatment of Fruit Processing Waste Waters, National Canners Association, Berkeley, California | GPO - $ .50 |
| 12060 FDS 11/71 | Elimination of Water Pollution By Packinghouse Animal Paunch and Blood, Beefland International Inc., Council Bluffs, Iowa | GPO - $ .50 |

LOCATION OF MAJOR FOOD PROCESSING PLANTS



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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPD 93-04-68 (PPB 12060)

TITLE OF PROJECT: Anaerobic-Aerobic Sugar Beet Waste Treatment

GRANTEE OR CONTRACTOR:
Beet Sugar Development Foundation
156 South College Avenue
P.O. Box 538
Fort Collins, Colorado 80521

EPA PROJECT OFFICER:
Mr. Ralph Scott
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Tracy, California

DESCRIPTION OF PROJECT

Award Date: June 1, 1968

Completion Date: July 31, 1969

Project Cost: $34,550 (4th year)

Federal Cost: $25,300 (4th year)

Summary:

The objective of this project is to demonstrate a solution to the pollution and odor problems encountered in beet sugar factory waste disposal. This will be accomplished by passing the wastes (mainly screened flume water) through a system of anaerobic-facultative-aerobic lagoons set up in series. Some water from the aerobic lagoon will be recycled back to the surface of the anaerobic lagoon to eliminate odors.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WP-01486-01 (PPB 12060)

TITLE OF PROJECT: Current Practice in Potato Processing Waste Treatment

GRANTEE OR CONTRACTOR:
Department of Civil Engineering
University of Washington
Seattle, Washington 98105

EPA PROJECT OFFICER:
James Boydston
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 1, 1968 | Project Cost: | $19,331 |
| Completion Date: | June 30, 1970 | Federal Cost: | $18,364 |

Summary:

The continued rapid growth of the potato processing industry represents a corresponding increase in wastewater volume. The final report to this project discusses potato processing, waste treatment, and current and needed research in water quality control in this production field. A brief description is given in the report of general characteristics of the potato and the effects and importance of cultural and environmental conditions on potato processing. General descriptions of the production processes have been included and the literature has been extensively reviewed to present current and proposed waste treatment technology. The most urgent research needs are discussed together with suggested methods for meeting these needs.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration. *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FDR

TITLE OF PROJECT: Disposal of Rum Distillery Wastes

GRANTEE OR CONTRACTOR:
Agricultural Experiment Station
University of Puerto Rico
Rio Piedras, Puerto Rico

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Rio Piedras, Puerto Rico

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 1, 1968 | Project Cost: $85,400 |
| Completion Date: July 1, 1971 | Federal Cost: $46,252 |

Summary:

The objective of this project is to develop the best method for the disposal of rum distillery waste. The waste will be subjected to detailed analysis and then will undergo pilot treatment by means of anaerobic digestion, activated sludge, and lagooning. These processes will then be evaluated in terms of efficiency and economics.

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 DSI

TITLE OF PROJECT: State-of-the-Art of Sugarbeet Processing Waste Treatment

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Beet Sugar Development Foundation<br>156 South College Avenue<br>P.O. Box 538<br>Fort Collins, Colorado 80521 | Kenneth Dostal<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Fort Collins, Colorado

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | April 18, 1969 | Project Cost: | $15,900 |
| Completion Date: | June 1, 1970 | Federal Cost: | $14,310 |

Summary:

Development of a state-of-the-art document encompassing current domestic and foreign waste treatment technology in the sugarbeet processing industry will be the main objective of this project. The report will include recommendations on major research needs.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EHS

TITLE OF PROJECT: Cannery Waste Treatment by Lagoons

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Melbourne Water Science Institute<br>Water Science Laboratories<br>15-21 Earl Street<br>Carlton, Victoria, Australia | Kenneth Dostal<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Shepparton, Victoria, Australia

DESCRIPTION OF PROJECT

Award Date: May 1, 1969 Project Cost: $61,810

Completion Date: January 1, 1972 Federal Cost: $11,920

Summary:

In this study, demonstration of the feasibility of treating fruit and vegetable processing wastes by anaerobic lagoons and oxidation ditches will be undertaken.

The existing 100,000-gpd facilities at Shepparton will continue to be used during the final year of this project to evaluate and optimize operational parameters of the anaerobic-aerobic system operating jointly or independently.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EDK

TITLE OF PROJECT: Production and Disposal Practices for Liquid Wastes From Canning and Freezing Fruits and Vegetables

GRANTEE OR CONTRACTOR:
National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D.C. 20036

EPA PROJECT OFFICER:
William Pierce
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: NCA, Berkeley, California
University of Wisconsin, Madison, Wisconsin

DESCRIPTION OF PROJECT

Award Date: May 6, 1969 Project Cost: $22,542

Completion Date: September 15, 1970 Federal Cost: $20,025

Summary:

The objective of this project will be the development of a state-of-the-art document to encompass:

1. Determination of current and projected contributions of this industry to the national water pollution problem.
2. Description of present and anticipated waste treatment technology to include construction and operational data.
3. Identification of areas requiring further development.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 ECF

TITLE OF PROJECT: Current Practice in Seafoods Processing Waste Treatment

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>Department of Food Science and Technology<br>Oregon State University<br>Corvallis, Oregon 97331 | EPA PROJECT OFFICER:<br>Kenneth Dostal<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 1, 1969 | Project Cost: $18,652 |
| Completion Date: January 4, 1971 | Federal Cost: $17,695 |

Summary:

The final report on this project contains discussions of the processing of the major United States seafoods species, the resultant wastewater strengths and flows, solid wastes magnitudes, current treatment and by-product recovery methods, and current and recommended research in water pollution abatement. The geographic distribution of fish and shellfish landings and products is described. The report is based on a comprehensive literature review and extensive on-site investigations of current research, processing, and treatment activities in the major seafoods centers of the United States.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**CLEAN WATER**

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EGU

TITLE OF PROJECT: State-of-the-Art of Dairy Plant Wastes and Waste-Treatment Systems

GRANTEE OR CONTRACTOR:
Ohio State University Research Foundation
1314 Kinnear Rd.
Columbus, Ohio 43212

EPA PROJECT OFFICER:
Eugene Harris
National Environmental Research Center, EPA
Cincinnati, Ohio 45268

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | July 1, 1969 | Project Cost: | $18,505 |
| Completion Date: | May 30, 1971 | Federal Cost: | $12,954 |

Summary:

The objective of this project is the development of a state-of-the-art document for the dairy industry. Plant processing methods, water utilization, waste streams in various size and type of operations, dairy food plant waste treatment systems as a function of processing practice, plant size and location, current industrial development in dairy food processing and waste treatment, present research in progress, and future research needs in relation to dairy wastes will be covered.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Demonstration , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FQE

TITLE OF PROJECT: Dry Caustic Peeling of Tree Fruit to Reduce Liquid Waste Volume and Strength

GRANTEE OR CONTRACTOR:
National Canners Association
1950 Sixth Street
Berkeley, California 94710

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: March 30, 1970 Project Cost: $19,539

Completion Date: December 31, 1970 Federal Cost: $17,538

Summary:

The National Canners Association, in cooperation with the U.S. Department of Agriculture, will install demonstration-scale equipment in a fruit cannery. The basic project objectives are to demonstrate the feasibility of using the dry caustic peeling process in the processing of tree fruit. Operational data will be collected during the grant period which will allow the comparison of the yield and quality of the peeled fruit and the quantity and quality of the process wastes with the conventional peeling process.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Contract, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FTC

TITLE OF PROJECT: State-of-the-Art Study for Pollution Control in the Beverage Industry

GRANTEE OR CONTRACTOR:
Resource Engineering Associates
Division of Environmental Research and Applications, Inc.
24 Danbury Road
Wilton, Connecticut 06897

EPA PROJECT OFFICER:
Harold G. Keeler
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Wilton, Connecticut

DESCRIPTION OF PROJECT

Award Date: September 16, 1970
Project Cost: $53,664

Completion Date: September 1, 1971
Federal Cost: $53,664

Summary:

The objective of this study will be the development of a state-of-the-art document on water pollution abatement technology and research for the beverage industry.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

### ENVIRONMENTAL PROTECTION AGENCY
### RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPRD 38-01-67 (FPB 12060)

TITLE OF PROJECT: Treatment of Citrus Processing Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Minute Maid Company<br>Orlando, Florida | Dr. David Hill<br>Southeast Water Laboratory, EPA<br>College Station Road<br>Athens, Georgia 30601 |

Project Site: Leesburg, Florida
Auburndale, Florida

DESCRIPTION OF PROJECT

Award Date: December 13, 1966 Project Cost: $550,000

Completion Date: December 31, 1969 Federal Cost: $350,000

Summary:

Plant-scale studies were performed in this project to determine operational and treatment parameters for citrus processing wastewaters. Part I of the final report discusses treatment of concentrated citrus processing wastewaters combined with domestic sewage using a modified activated sludge process; namely, extended aeration. Part II discusses treatment of weak processing wastewaters using a system which functioned as an aerated lagoon.

Extended aeration yielded 94 to 95 per cent BOD removal; however, difficulties concerning positive control of the treatment process were encountered. Variations in mixed liquor suspended solids concentrations, sludge volume indices, sludge recirculation rates, and hydraulic loading were considered principal causes adversely affecting the treatment process. Excess sludge buildup amounted to approximately 0.5 pounds per pound of influent BOD and sludge wastage accounted for the greater portion of overall nutrient removal from the system. The aerated lagoon process afforded 91 per cent BOD removal when daily average hydraulic and organic loadings were controlled at 6.4 mgd and 6770 pounds, respectively (detention time 7.9 days).

Ecological studies indicated that BOD:N:P ratios of the order of 150:5:1 were adequate for supporting the population of organisms required for effective bio-oxidation. Organic nutrient removal studies using hyacinths indicated a minimum of 5 days' detention would be required to afford substantial nutrient reduction. Significant organic loading reductions (BOD,COD) were also attained by the hyacinth plant system during the 5-day detention period.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EUB

TITLE OF PROJECT: Construction and Study of a Demonstration Plant Utilizing the Aerobic Channel Method for Treating Packinghouse Wastes

GRANTEE OR CONTRACTOR:
John Morrell and Company
Ottumwa, Iowa 52501

EPA PROJECT OFFICER:
Jack L. Witherow
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Ottumwa, Iowa

DESCRIPTION OF PROJECT

Award Date: December 23, 1966 Project Cost: $815,000

Completion Date: July 7, 1972 Federal Cost: $489,000

Summary:

Four oxidation channels will be constructed to handle an equivalent load of 20,000 lbs. of BOD/day from a packinghouse on a 7-day basis with estimated flow of 3.5 mgd. The objective is to find an efficient, effective, and economical method of treating raw packinghouse wastes so they can be discharged directly into streams.

Each channel will be 460 ft x 60 ft with a capacity of 150,000 cu. ft. Channels 1 and 2 will receive raw wastewater from existing primary treatment systems. The overflow will be directed into Channels 3 and 4 which will be operated intermittently as aerator and settling basins. Channel 4 will allow the sludge to be returned to Channels 1 and 2 or removed for harvesting. The solids removed will be centrifuged or evaporated and dried.

The most feasible way of handling solids will be determined. Tests will be conducted to determine if the dried solids can be used on an animal-food supplement.

The process will be designed to give variable rates of aeration and flow to obtain maximum biochemical oxygen demand and nitrogen removal. The flow will be sampled and analyzed for total nitrogen, chemical oxygen demand, suspended solids, total solids, and grease; weekly samples will be tested for total volatile solids, total fixed solids, phosphate, total bacterial content, and coliform count.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FAK

TITLE OF PROJECT: Concentration of Sugar Beet Wastes for Economic Treatment with Biological Systems

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Beet Sugar Development Foundation<br>156 South College Avenue<br>P.O. Box 538<br>Fort Collins, Colorado 80521 | Ralph Scott<br>Pacific Northwest Water Laboratory<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Fort Collins, Colorado

DESCRIPTION OF PROJECT

Award Date: December 28, 1966    Project Cost: $372,500

Completion Date: May 1, 1970    Federal Cost: $102,000

Summary:

This project is one phase of research to find an economic chemical or biological system to treat high volumes of sugar beet factory waste. One or more successful processes are necessary to satisfy effluent standards in states where sugar beets are processed.

The objective of the project is to concentrate sugar beet factory wastes by chemical precipitation and reuse of the decanted solution in a closed recirculation system. The excess water accumulated during the operation will be treated by anaerobic and/or aerobic processes to remove BOD prior to discharge. The bioactivity will be studied concurrently.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EZP

TITLE OF PROJECT: Cannery Waste Treatment Kehr Activated Sludge

GRANTEE OR CONTRACTOR:
FMC Corporation
Central Engineering Laboratories
Box 580
Santa Clara, California 95052

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Santa Clara, California

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | December 31, 1966 | Project Cost: | $43,200 |
| Completion Date: | January 31, 1969 | Federal Cost: | $29,300 |

Summary:

The Kehr Activated Sludge Process (KASP), as practiced at the FMC Corporation's Central Engineering Laboratories, uses a completely mixed aeration tank with no intentional sludge wasting. The concentration of mixed liquor suspended solids was allowed to stabilize at some value as a result of cellular synthesis, endogenous loss, and washout in the effluent. The concentration of mixed liquor suspended solids ranged from 4,000 to 12,000 mg/liter. The BOD$_5$ of domestic sewage and cannery wastes varied from 200 to 2000 mg/liter.

Removals obtained were 80 per cent reduction in the concentration of total organic carbon and 90 per cent reduction in the concentration of BOD$_5$.

The process was able to undergo a 48-hour period of no organic loading with no loss of treatment efficiency when the organic load was returned. The KASP appears to have an application for pretreatment of industrial wastes prior to discharge to a municipal sewer. The KASP, when used in this manner, could handle intermittent waste discharge, produce 90 per cent BOD$_5$ removal, and provide aerobic digestion within the aeration tank.

Exclusive of any primary treatment, the cost of treating 10 mgd of a waste containing 250 mg/liter of BOD$_5$ using this high solids activated sludge process is about 7¢/1000 gallons using gravity settling and about 29¢/1000 gallons using electroflotation. The cost of pretreating 1 mgd of a waste containing 2,000 mg/liter BOD is about 28¢/1000 gallons exclusive of primary treatment.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FAD

TITLE OF PROJECT: Aerobic Treatment of Fruit Processing Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Snokist Growers<br>Yakima, Washington | James Boydston<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Yakima, Washington

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | August 4, 1967 | Project Cost: | $572,262 |
| Completion Date: | March 24, 1970 | Federal Cost: | $347,669 |

Summary:

In 1966, it was determined that the Snokist Growers cannery in Yakima, Washington, was in need of further treatment facilities for the cannery waste before the waste could be discharged into the Yakima River. A system of aeration was proposed and a grant sought to aid in construction of facilities and to study the results of the treatment facility following construction. Facility construction proceeded in two stages with the addition of an aerated lagoon in 1967 and the addition of additional aeration and clarification facilities in 1968 to complete the treatment system. The treatment system performed more efficiently than initially expected in the original design assumptions, and nearly 99 per cent removal of BOD and COD from the waste stream was accomplished during a major portion of the 1968 processing season.

The treatment systems were studied over the two operating seasons, and operated as an aerated lagoon, as an activated sludge treatment system and as activated sludge system but including sludge reaeration. Data was collected on biological substrate assimilation, sludge growth, oxygen uptake and sludge settleability. Constants were obtained from this data. Success of the treatment system is described in the final report on the project and the costs of treatment computed. It is recommended that aerated lagoon treatment be used where 70 per cent removal of BOD is desired and suspended solids are permissible in the effluent. Activated sludge treatment is recommended for greater than 90 per cent BOD removal and where effluent suspended solids must be minimized.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EHV

TITLE OF PROJECT: Aerobic Secondary Treatment of Potato Processing Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| The R. T. French Company<br>Shelley, Idaho | James Boydston<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Shelley, Idaho

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | August 29, 1967 | Project Cost: | $690,310 |
| Completion Date: | March 15, 1971 | Federal Cost: | $483,217 |

Summary:

As described in the final report to this project, the new secondary treatment facility at the R.T. French Company, Shelley, Idaho, has demonstrated the feasibility of a complete mix activated sludge system for secondary treatment of potato processing wastes. The secondary treatment facility was designed for an average daily flow of 1.25 million gallons per day and a BOD loading of 14,000 pounds per day. Frequent aerator shutdowns following mechanical problems have limited oxygen transfer and biological activity in the aeration basins; however, BOD removals of over 90 per cent have been obtained for extended periods of time, demonstrating the applicability of the activated sludge process for treating the wastes. These removals have been obtained with: (1) MLSS concentrations between 2,000 mg/l and 8,000 mg/l, (2) aeration basin D.O. concentrations between 0.3 m/l and 5.2 mg/l, (3) aeration basin temperatures between 45 degrees F and 67 degrees F, (4) aeration basin pH between 7.1 and 8.4, (5) organic loadings between 10 and 120 lb BOD/1,000 cu ft/day, (6) hydraulic detention times of 0.9 to 8.7 days, and (7) BOD/MLVSS ratios of 0.15 to 0.47.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EHT

TITLE OF PROJECT: Use of Fungi Imperfecti in Waste Control

GRANTEE OR CONTRACTOR:
North Star Research and
Development Institute
3100 38th Avenue South
Minneapolis, Minnesota 55406

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Minneapolis, Minnesota

DESCRIPTION OF PROJECT

Award Date: September 1, 1967 Project Cost: $118,585

Completion Date: July 1, 1970 Federal Cost: $76,585

Summary:

In this project, 45 species of 12 genera of the Fungi Imperfecti were screened for those fungal candidates best able to rapidly convert soluble and suspended organic material (as measured by BOD) from corn- and soy food-processing waste streams to mycelial protein. Rapidly growing fungal strains were selected which were readily removed from the digested waste effluents by coarse filtration. Trichoderma viride, Gliocladium deliquescens, and either Aspergillus oryzae or G. deliquescens gave the best results on corn, soy, and $SO_2$-containing soy wheys, respectively. Optimal growth conditions included pH of 3.2 to 3.5, and a temperature of 30°C. Oxygen requirements were relatively low (1 lb $O_2$/6-7 lb COD removed). Nitrogen and phosphate additions were required for the corn digestion system, and additions of sulfuric acid were necessary to adjust the pH. Corn waste was reduced from an initial BOD level of 1600 mg/l to 25 mg/l in 24 hours. Soy wastes were reduced from 6200 mg of BOD/l to 125 mg of BOD/l in 36 hours of incubation.

Studies of rapid fungal digestion of soy whey containing 700 mg/l of $SO_2$ resulted in selection of A. oryzae and G. deliquescens strains which removed $SO_2$ from the medium. Mycelial yields were approximately 50 to 60 g of dry mycelium per 100 g of COD utilized. The stability of the continuous fermentation with corn waste was demonstrated in a fermentation run of 140 days' length. The protein content of mycelium recovered from the continuous culture corn digestion system was 45 per cent.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12060 EZY

TITLE OF PROJECT: Lime Treatment and Inplant Reuse of an Activated Sludge Plant Effluent in the Citrus Processing Industry

GRANTEE OR CONTRACTOR:
Winter Garden Citrus Products Cooperative
P.O. Box 399
Winter Garden, Florida

EPA PROJECT OFFICER:
Dr. David Hill
Southeast Water Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Winter Garden, Florida

DESCRIPTION OF PROJECT

Award Date: December 22, 1967 Project Cost: $397,300

Completion Date: August 30, 1971 Federal Cost: $165,000

Summary:

The objective of this proposal will be to develop operational parameters and conduct an economic evaluation on lime treatment of effluent from a 2-mgd activated sludge system treating citrus wastes and in-plant reuse of the lime treatment effluent. This study will cover lime treatment with the addition of coagulant aids and dewatering of sludges by centrifugation for usage in cattle feed preparation. Determination will be made on the effect of this system in further reducing BOD, COD, and nutrients found in the activated sludge effluent.

The proposed project intends to demonstrate the effectiveness of lime precipitation on effluent from a 2-mgd activated sludge system treating citrus wastes. The activated sludge system consists of an aeration pond providing from 24 to 36 hours detention time with the overflow being directed into a final clarifier. Operation of the activated sludge system will afford pH control along with nutrient supplementation and sludge recirculation.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EHU

TITLE OF PROJECT: Reconditioning of Food Processing Brines

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| National Canners Association<br>Research Foundation<br>1133 20th Street, N.W.<br>Washington, D.C. 20036 | William Pierce<br>Region IX, EPA<br>760 Market Street<br>San Francisco, California 94102 |

Project Site: Central Valley, California

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | February 1, 1968 | Project Cost: | $45,000 |
| Completion Date: | March 1, 1971 | Federal Cost: | $31,500 |

Summary:

In this project, storage brines and processing waters from the production of canned ripe olives and glass packed green olives were treated with activated carbon. The reuse potential of reconditioned brines was evaluated. Reconditioned storage brines can be used to store freshly harvested olives for commercially significant periods. Canned samples prepared from olives stored in reconditioned brine were of good quality. Reconditioned brines of lower salt content were reused with no detectable effect on the quality of the final product.

Estimates for commercial application of activated carbon treatment of storage brines show a cost per ton of olives stored of $3.64 when capital costs are amortized over 10 years for a cannery storing 5,000 tons of olives annually. This value can also be expressed as a cost of $36.40 for each 1,000 gallons of reconditioned brine produced. Ten olive canneries reconditioning brine and sending spent carbon to a centrally located reactivation facility would have a cost of $1.28 per ton of olives stored or $12.80 for each 1,000 gallons of reconditioned brine produced.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: WPRD 3-01-68 (PPB 12060)

TITLE OF PROJECT: Improvement of Treatment of Food Industry Waste

GRANTEE OR CONTRACTOR:
RAI Research Corporation
36-40 37th Street
Long Island City, New York 11101

EPA PROJECT OFFICER:
Allyn Richardson
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Long Island City, New York

DESCRIPTION OF PROJECT

Award Date: February 9, 1968

Project Cost: $57,250

Completion Date: July 31, 1969

Federal Cost: $40,075

Summary:

The electrochemical oxidation of milk whey on a laboratory scale will be investigated as a method of waste treatment.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPRD 151-01-68 (EPB 12060)

TITLE OF PROJECT: Waste Reduction in Food Canning Operations

GRANTEE OR CONTRACTOR:
National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D.C. 20036

EPA PROJECT OFFICER:
William Pierce
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: San Jose, California

DESCRIPTION OF PROJECT

Award Date: February 14, 1968

Project Cost: $55,120

Completion Date: April 24, 1970

Federal Cost: $33,330

Summary:

In this project, various methods of reducing wastes in food canning operations were examined. These methods included trickling filters, pH control, an air flotation system, and screens.

A high-rate trickling filter was constructed, utilizing light weight, self-supporting plastic packing medium that provided large uniform surface area for microbial growth. The effects of hydraulic loading and nutrient addition on soluble BOD removal from fruit wastewater were investigated. To examine the effects of pH control, fruit pumping water was acidified with citric acid and controlled at pH 4.0 or below to inhibit bacterial growth and to extend the use of recirculated water. The sanitary condition of the acidified system was equal to or better than a comparable non-acidified system. An air flotation system was evaluated for suspended solids removal efficiency. The influent to recycle ratio was 1:1. In general, the removal efficiency decreased as the hydraulic rate increased.

A single-deck and a double-deck circular vibrating screen were evaluated for solids separation. The maximum capacity of the single (20 mesh) deck was 1000 gpm. With a 64-mesh, capacity was reduced to 300 - 400 gpm. Compared to 20-mesh rectangular screen, 48-mesh removed 32.2 per cent more solids. For the double deck, numerous combinations of top and bottom screens were tested. With a 20-mesh top and 100-mesh bottom, the unit handled 1500 gpm or 1.5 times the single deck unit. More than 5 per cent of influent must overflow from top screen onto bottom screen; otherwise abrasive action of screen will increase solids in effluent.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 DQV

TITLE OF PROJECT: Removal and Recovery of Fatty Materials from Edible Fat and Oil Refinery Effluents

GRANTEE OR CONTRACTOR:
Swift and Company
R&D Center
1919 Swift Drive
Oak Brook, Illinois 60521

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Bradley, Illinois

DESCRIPTION OF PROJECT

Award Date: July 10, 1968 Project Cost: $389,970

Completion Date: February 1, 1971 Federal Cost: $249,307

Summary:

This study to be conducted at the Swift and Company Bradley Refinery plant will have, as its main objectives, demonstration of the effectiveness and economics of employing air flotation for the removal and recovery of fatty material present in water eminating from processing operations.

In addition to an extensive study of flocculating agents, a complete characterization of processing waste streams is planned. Laboratory analysis will include BOD, COD, ether solubles,and suspended solids determinations, etc.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12060 DPE

TITLE OF PROJECT: Treatment of Wastes from the Wet-Milling Industry

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Corn Products Company<br>Corporate Engineering<br>P.O. Box 345<br>Argo, Illinois 60501 | Clifford Risley<br>Region V, EPA<br>1 North Wacker Drive<br>Chicago, Illinois 60606 |

Project Site: Pekin, Illinois

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | July 24, 1968 | Project Cost: | $2,656,400 |
| Completion Date: | January 24, 1972 | Federal Cost: | $482,680 |

Summary:

This project entails the design, construction, operation, and an economic and technical evaluation of a 1-mgd, completely mixed aerobic system for treatment of corn refining wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 DSB

TITLE OF PROJECT: Demonstration of a Full-Scale Waste Treatment System for a Cannery

GRANTEE OR CONTRACTOR:
University of Oklahoma Research Institute
1808 Newton Drive
Norman, Oklahoma 73069

EPA PROJECT OFFICER:
George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Stilwell, Oklahoma

DESCRIPTION OF PROJECT

Award Date: July 25, 1968

Project Cost: $117,807

Completion Date: August 31, 1970

Federal Cost: $75,226

Summary:

The objective of this study will be to conduct an economic and technical evaluation of a 1.5-mgd biological system employing a combination of both the minimal solids and extended aeration techniques to treat high strength, nutritionally unbalanced cannery wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

**PROJECT NUMBER:** 12060 DFF

**TITLE OF PROJECT:** Waste Treatment Facility, Farmbest, Inc., Denison, Iowa

| **GRANTEE OR CONTRACTOR:** | **EPA PROJECT OFFICER:** |
|---|---|
| Farmbest, Inc.<br>Denison, Iowa | Otmar Olson<br>Region VII, EPA<br>911 Walnut Street<br>Kansas City, Missouri 64106 |

**Project Site:** Denison, Iowa

**DESCRIPTION OF PROJECT**

| | | | |
|---|---|---|---|
| **Award Date:** | October 5, 1968 | **Project Cost:** | $755,587 |
| **Completion Date:** | April 30, 1971 | **Federal Cost:** | $289,790 |

**Summary:**

The objective of this project is to demonstrate, over one full year of operation, the application of anaerobic lagoons and two-stage trickling filters for the treatment of strong wastes resulting from the slaughtering and processing of hogs. This plant kills about 5000 hogs daily and waste flows average about 0.85 mgd. Data will be collected on the strength of wastes and the efficiency of individual treatment units under various loadings and weather conditions so the results can be projected for new plants using any combinations of these treatment units.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12060 DEQ

TITLE OF PROJECT: Elimination of Pollution by and Utilization of Protein Concentrates (Dried Whey) from Milk Residues of Cheese Making

GRANTEE OR CONTRACTOR:
Dairy Research and Development Corporation
111 Broadway
New York, New York 10006

EPA PROJECT OFFICER:
Mr. Max Cochran
NERC
200 S.W. 35th St.
Corvallis, Oregon 97330

Project Site: Vernon, New York

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | December 19, 1968 | Project Cost: | $2,499,038 |
| Completion Date: | January 1, 1972 | Federal Cost: | $551,350 |

Summary:

A development and full-scale demonstration for a process for the conversion of dairy whey into saleable food products by evaporation and spray drying methods will be undertaken in the project. The conversion of whey to a useable food product in lieu of its disposal as a waste product from cheese manufacturing is the pollution abatement method to be developed and demonstrated. Research will be conducted on the use of dried whey as a supplement to various food products.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EAE

TITLE OF PROJECT: Evaluation of Controlled Temperature and Forced Aeration in Trickling Filter Treatment of Food Canning Wastewaters

GRANTEE OR CONTRACTOR:
National Canners Association
Research Foundation
1133 20th Street, N.W.
Washington, D.C. 20036

EPA PROJECT OFFICER:
William Pierce
Region IX, EPA
760 Market Street
San Francisco, California 94102

Project Site: San Jose, California

DESCRIPTION OF PROJECT

Award Date: June 11, 1969

Project Cost: $28,712

Completion Date: May 20, 1970

Federal Cost: $18,350

Summary:

The objectives of this project to be conducted at the DelMonte Corporation Plant No. 3 at San Jose, California are as follows:

1. Evaluation of the performance and BOD reduction capacity on high strength liquid canning wastes of a 10,000-gpd trickling filter unit containing such special features as forced aeration and temperature control of the treatment column preceeded by grinding and screening components.
2. Comparison of the efficiency of this unit with that of the trickling filter without temperature control and forced aeration operated under WPRD 151-01-68 by subjecting them both to identical loadings emanating from the same waste source.
3. Incorporation of the results of this evaluation into the design of a full-scale demonstration project to be implemented in 1970. This project is an extension of work initiated under WPRD 251-01-68.

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 DXF

TITLE OF PROJECT: Development and Demonstration of an Ultrafiltration Plant for the Abatement of Pollution from Cottage Cheese Whey

GRANTEE OR CONTRACTOR:
Crowley's Milk Company, Inc.
145 Conklin Avenue
Binghamton, New York 13902

EPA PROJECT OFFICER:
Max W. Cochrane
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Binghamton, New York (Phase I)
La Fargeville, New York (Phase II)

DESCRIPTION OF PROJECT

Award Date: July 1, 1969  Project Cost: $914,081

Completion Date: January 1, 1972  Federal Cost: $495,856

Summary:

A two-stage ultrafiltration system for the separation and concentration of protein and lactose or straight acid whey concentration with a resulting influent BOD reduction of 99 per cent will be demonstrated. Phase I, lasting 13 months, calls for the design, detailed engineering, construction, operation and evaluation in Binghamton, New York of a 10,000 lb/day UF system and will include the design of a 250,000 lb/day system for full-scale demonstration under Phase II. Duration of Phase II will be 17 months.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12060 EDZ

TITLE OF PROJECT: Pilot-Plant Installation for Use of Fungi Imperfecti on Vegetable Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Green Giant Company<br>LeSueur, Minnesota 56058 | Kenneth Dostal<br>Pacific Northwest Water Laboratory, EPA<br>200 Southwest 35th Street<br>Corvalis, Oregon 97330 |

Project Site: North Star Research and Development Institute
Minneapolis, Minnesota

DESCRIPTION OF PROJECT

Award Date: July 1, 1969 Project Cost: $72,860

Completion Date: December 31, 1970 Federal Cost: $49,742

Summary:

The basic objective of this study is to demonstrate and evaluate on a pilot-scale basis the use of fungi imperfecti as a biological agent in a aerated treatment system which treats high BOD vegetable processing wastes. According to bench-scale tests the fungi are capable of removing organic nutrients with a related BOD reduction in excess of 98 per cent with a 20-hour residence time. An aerated lagoon and aerated ditch will be employed to evaluate the fungi as a system component and the related operational and system characteristics will be defined.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12060 EGV

TITLE OF PROJECT: Water and Waste Management in Poultry Processing

GRANTEE OR CONTRACTOR:
Gold Kist Poultry Division
Cotton Producers Association
P.O. Box 2210
Atlanta, Georgia 30301

EPA PROJECT OFFICER:
Harold Snyder
Oil and Hazardous Materials Program
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Gold Kist Poultry
910 Latta Street, Durham, North Carolina

DESCRIPTION OF PROJECT

Award Date: July 1, 1969 Project Cost: $283,381

Completion Date: October 30, 1971 Federal Cost: $198,366

Summary:

The University of North Carolina will conduct this study which involves changes in the Gold Kist processing operations for demonstration of effective in-plant control of both water use and discharge of effluent from poultry processing. The project encompasses water use and waste abatement throughout the plant, from water intake through final wastewater collection and control.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EIG

TITLE OF PROJECT: Full-Scale Demonstration and Evaluation of Potato Dry and Wet Caustic Peeling Processes

GRANTEE OR CONTRACTOR:
Western Potato Service, Inc.
P.O. Box 1391 Highway #2 West
Grand Forks, North Dakota 58201

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Presque Isle, Maine (Wet)
Grand Forks, North Dakota (Dry)

DESCRIPTION OF PROJECT

Award Date: July 1, 1969 Project Cost: $1,042,212

Completion Date: August 1, 1971 Federal Cost: $396,574

Summary:

The objective of this grant will be to demonstrate at full scale the economics and pollution reduction characteristics of a potato "dry" caustic peeling system and use as a base for comparison data to be obtained from a similar facility employing the conventional "wet" caustic peeling operation.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EKQ

TITLE OF PROJECT: Kent Cheese Company - Waste Treatment Facility

GRANTEE OR CONTRACTOR:
Kent Cheese Company
1931 North 15th Avenue
Melrose Park, Illinois 60160

EPA PROJECT OFFICER:
Dennis W. Taylor
Pacific Northwest Water Laboratory, EPA
200 Southwest35th Street
Corvallis, Oregon 97330

Project Site: Kent, Illinois

DESCRIPTION OF PROJECT

Award Date: July 1, 1969

Project Cost: $65,722.80

Completion Date: April 1, 1972

Federal Cost: $46,006.00

Summary:

In this project, demonstration of the effectiveness of aerated lagoons for the treatment of cheese whey process rinse water, in addition to the effluent from a reverse osmosis unit, is demonstrated. The treatment system utilizes two aerobic lagoons in series with submerged mechanical aeration equipment producing an extended aeration process. Data is collected to evaluate the extented aeration process on the aforementioned cheese whey wastewater streams.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EOF

TITLE OF PROJECT: A Method of Manure Disposal for a Beef Packing Operation

GRANTEE OR CONTRACTOR:
Illinois Packing Company
911 West 37th Place
Chicago, Illinois 60609

EPA PROJECT OFFICER:
Jack L. Witherow
R.S. Kerr Water Research Center, EPA
P.O. Box 1198
Ada, Oklahoma 74820

Project Site: Illinois Packing Co.

DESCRIPTION OF PROJECT

Award Date: October 22, 1969 Project Cost: $156,000

Completion Date: June 21, 1971 Federal Cost: $93,400

Summary:

In this 20-month project, demonstration of the feasibility of the incineration of cattle paunch and ground manure will be undertaken. The project objectives will include the following:

1. Segregation of existing process waste streams for concentration of waste solids.
2. Development of physical parameters for process waste streams.
3. Design and construction of a fluidized bed incineration unit.
4. Investigation and documentation of the treatment system performance, the economics, optimal operating characteristics and the significance of the system in terms of application to other segments of the animal production industry.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FDS

TITLE OF PROJECT: Elimination of Water Pollution by Packing House Animal Paunch and Blood

GRANTEE OR CONTRACTOR:
Beefland International, Inc.
Council Bluffs, Iowa 51501

EPA PROJECT OFFICER:
Otmar Olson
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: Council Bluffs, Iowa

DESCRIPTION OF PROJECT

Award Date: November 10, 1969

Project Cost: $367,870

Completion Date: November 1, 1971

Federal Cost: $161,398

Summary:

This project will demonstrate the economic and technical feasibility of completely segregating blood and paunch from slaughterhouse operations and converting these materials into animal feed ingredients. Two dehydrators will be installed at Beefland International, Inc. and utilized to process the material generated from anticipated cattle kills of 250 head per hour.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 DXL

TITLE OF PROJECT: Reduction of Salt Content of Food Processing Liquid Waste Effluent

GRANTEE OR CONTRACTOR:
National Canners Association
Research Foundation
1133 20th Street
Washington D.C. 20036

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: December 8, 1969

Project Cost: $94,208

Completion Date: May 1, 1971

Federal Cost: $64,382

Summary:

The project will demonstrate the effectiveness of an ion exchange system for the treatment of olive brine wastewater. The 10,000-gpd pilot unit will use calcium hydroxide as a resin regenerant and will be operated jointly by the National Canners Association and Aqua Ion Corporation. The operating parameters of the system will be established and scale-up factors determined. It is anticipated that the degree of treatment will encourage the olive industry to consider water reuse and product recovery when full-scale installations are considered.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 EUZ

TITLE OF PROJECT: Winery Wastewater-Characterization and Treatment

GRANTEE OR CONTRACTOR:
Widmer's Wine Cellars, Inc.
Naples, New York 14512

EPA PROJECT OFFICER:
Dennis W. Taylor
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Naples, New York

DESCRIPTION OF PROJECT

Award Date: December 18, 1969 Project Cost: $284,000

Completion Date: February 17, 1972 Federal Cost: $148,900

Summary:

This project includes design, construction, and operation of an extended aeration waste treatment plant to treat the process wastewaters from a winery.

The activities of the project are the following:

1. Characterization of the winery wasteflow.
2. Design, construction and operation of an extended aeration waste treatment system.
3. Study and documentation of the treatment system.
4. Optimization of the system.
5. Determination of the effectiveness of nutrient addition to the operation of the system.

The facility will be designed for a 120,000-gpd flow.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *.*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FJK

TITLE OF PROJECT: Acid Emulsion Breaking-Activated Sludge for Bakery Waste

GRANTEE OR CONTRACTOR:
Ebinger Baking Co.
2290 Bedford Ave.
Brooklyn, New York 11226

EPA PROJECT OFFICER:
Charles H. Ris
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Melville, New York

DESCRIPTION OF PROJECT

Award Date: June 9, 1970

Project Cost: $464,860

Completion Date: April 30, 1972

Federal Cost: $129,729

Summary:

A waste treatment system will be designed, constructed, operated and evaluated for a 80,000-gpd effluent from a sweet-goods bakery. Acid emulsion breaking will be used as a pretreatment step to destabilize the fats and oils in the waste, and activated sludge will be used as the secondary treatment process. A multimedia filtration system will be then used to render the effluent suitable for subsurface leeching.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12060 FMF

TITLE OF PROJECT: Evaluation of the Rotating Biological Surface System on Meat Packing Wastes

GRANTEE OR CONTRACTOR:
Iowa Beef Packers, Inc.
Dakota City, Nebraska 68731

EPA PROJECT OFFICER:
William Garner
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: Dakota City, Nebraska

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 15, 1970 | Project Cost: | $559,230 |
| Completion Date: | June 30, 1972 | Federal Cost: | $195,751 |

Summary:

This project consists of building and evaluating a 3-mgd anaerobic-aerobic system where the aerobic treatment will be achieved by the use of 8 two-stage rotating biological surface units with a total surface area of 500,000 sq ft.

Design, operational, and economic data, including the existing pretreatment operations, will be documented.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FLL

TITLE OF PROJECT: Activated Sludge - Bio Disc Treatment of Distillery Wastes

GRANTEE OR CONTRACTOR:
American Distilling Co.
So. Front Street
Pekin, Illinois 61554

EPA PROJECT OFFICER:
Dennis W. Taylor
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Pekin, Illinois

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 22, 1970 | Project Cost: | $1,078,000 |
| Completion Date: | June 22, 1972 | Federal Cost: | $384,588 |

Summary:

The objectives of this project are to evaluate, on a plant-scale basis, the performance of the Bio Disc system and activated sludge processes for treating distillery wastewater. Investigations will involve evaluation of treatment efficiency, and the development of design parameters for industry-wide waste treatment process selection and sizing.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FRW

TITLE OF PROJECT: Water and Waste Management in Sweet Potato Processing

GRANTEE OR CONTRACTOR:
Tabor City Foods, Inc.
P.O. Box 398
Tabor City, North Carolina 28463

EPA PROJECT OFFICER:
Harold Thompson
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Tabor City, North Carolina

DESCRIPTION OF PROJECT

Award Date: July 1, 1970

Project Cost: $305,886

Completion Date: June 30, 1972

Federal Cost: $133,833

Summary:

The purpose of this project is to make changes in plant equipment and operations for demonstrating effective in-plant control of both water use and waste discharge and to demonstrate effective pretreatment of wastes from sweet potato processing. The project encompasses waste abatement and water use throughout the plant from water intake through pretreatment. The specific objectives are:

1. Installation and/or modification of a dry caustic peeling process and demonstrate its operation for water and waste reduction.
2. Installation and demonstration pretreatment and conditioning of wastewaters in the reduction of waste loads.
3. Determination of the economic implications of the water and waste reduction techniques demonstrated.
4. Formulation of guides for the management of water and waterborne wastes and the pretreatment of liquid wastes.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12060 FUR

TITLE OF PROJECT: Membrane Separation of Soybean Whey for Product Recovery and Waste Treatment

GRANTEE OR CONTRACTOR:
Central Soya Company, Inc.
1825 North Laramie Avenue
Chicago, Illinois 60639

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Chicago, Illinois

DESCRIPTION OF PROJECT

Award Date: September 29, 1970

Project Cost: $143,750

Completion Date: January 29, 1972

Federal Cost: $86,825

Summary:

During this 16-month project, the applicant will design, construct, and operate a pilot-scale membrane separation process for the treatment and product recovery from a soybean whey waste discharge. The pilot-scale facility will process 700 gallons per day of soybean whey and the operational data from the project will be used to establish the design scale-up factors and economic feasibility of a commercial size facility. The treatment and recovery system will consist of a two-stage membrane separation unit followed by an evaporation process. The system will be designed to handle a soybean whey discharge which in its diluted condition has a 4700 mg/l BOD, a 10,100 mg/l COD, a pH of 4.6 and a solids concentration of 15,000 mg/l.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

This sheet describes briefly a grant under Section 6 (b),
Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12060 GPP

TITLE OF PROJECT: Small Meatpacker Waste Treatment Systems

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| W. E. Reeves Packinghouse<br>P.O. Box 477<br>Ada, Oklahoma 74820 | Jack L. Witherow<br>R.S. Kerr Water Research Center, EPA<br>P.O. Box 1198<br>Ada, Oklahoma 74820 |

Project Site: Ada, Oklahoma

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: October 1, 1970 | Project Cost: $51,185 |
| Completion Date: February 1, 1973 | Federal Cost: $35,829 |

Summary:

The objectives of this project are to evaluate various biological systems for the treatment of small meatpackhouse waste flows. The specific objectives will include:

1. Demonstration to small meatpackers of the suitability of the anaerobic-aerobic lagoon system with high BOD removal, simplicity of operation, and minimum capital and maintenance costs.
2. Evaluation of the need for sludge recirculation in anaerobic lagoon and for aeration and sludge retention in the first-stage aerobic lagoon.
3. Determination of the economic and technical advantages of an aerated-aerobic lagoon system versus the anaerobic-aerobic lagoon system.
4. Demonstration to the meatpacking industry of the capability of the spray-runoff soil treatment system to meet future requirements for nitrogen and phosphorus removal in addition to high BOD reduction using the raw wastewaters, the anaerobic lagoon effluent, and the aerobic lagoon effluent.

The project data and evaluations of the waste treatment systems will provide the basis for the development of a manual for small meatpacking house-wastewater treatment.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 ESC

TITLE OF PROJECT: Separation, Dewatering, and Disposal of Sugarbeet Transport Water Solids

GRANTEE OR CONTRACTOR:
American Crystal Sugar Co.
Boston Bldg., P.O. Box 419
Denver, Colorado 80201

EPA PROJECT OFFICER:
Harold Thompson
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Crookston, Minnesota

DESCRIPTION OF PROJECT

Award Date: October 27, 1970 Project Cost: $782,135

Completion Date: June 1, 1973 Federal Cost: $179,840

Summary:

This development and demonstration project is divided into two phases and will be conducted over a 31-month period. Phase I is a laboratory and pilot-scale development activity during which time the optimum solids-clarification environment will be determined. A pilot-scale vacuum filtration unit will be evaluated for its ability to dewater the settleable sugarbeet water solids. At the conclusion of Phase I, a judgment will be made as to whether the proposed dewatering system is the best method for handling the solids from the transport water wastes.

Phase II is a 12-month activity which will consist of the design, construction, and operation of a full-scale solids handling system (vacuum filtration). The full-scale facility will be operated and studied for one processing season so as to establish a good data base for industry-wide recommendations.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FYG

TITLE OF PROJECT: Industrial Wastewater Reuse

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Maryland State Department of Health<br>301 W. Preston Street<br>Baltimore, Maryland 21201 | Mr. Ron Barrow<br>Southeast Water Laboratory<br>College Station Road<br>Athens, Georgia |

Project Site: Sterling Processing Co., Oakland, Maryland

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | January 11, 1971 | Project Cost: | $211,274 |
| Completion Date: | January 11, 1973 | Federal Cost: | $145,945 |

Summary:

The primary objective of this project is the establishment of criteria, by the Maryland State Department of Health, for treatment of industrial secondary effluents to permit recirculation and reuse of the final effluent in food processing operations. A 300-gpm double filtration system will be installed and operated at the Sterling Processing Co., Oakland, Maryland, a poultry processing facility.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 HFY

TITLE OF PROJECT: Dry Caustic Peeling of Clingstone Peaches on a Commercial Scale

GRANTEE OR CONTRACTOR:
Del Monte Corporation
215 Fremont Street
San Francisco, California 94119

EPA PROJECT OFFICER:
Harold Thompson
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: San Jose, California

DESCRIPTION OF PROJECT

Award Date: April 1, 1971

Completion Date: January 1, 1972

Project Cost: $71,293

Federal Cost: $49,900

Summary:

During the 9-month project period, Del Monte Corporation will design, construct, install, and operate a 15 ton per hour "dry caustic" unit on a clingstone peach line at Plant No. 3. Evaluation of this unit will provide a full-scale comparison with conventional peeling operations and substantiate earlier results obtained under project 12060 FQE. Previous data indicates water reduction from 530 to 35 gallons per ton of peaches processed is possible, as well as reducing COD and suspended solids in the liquid waste from 60 to 18 lbs/ton and 10 to 3 lbs/ton respectively.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 PAV

TITLE OF PROJECT: Low Water Volume Enzyme Deactivation of Vegetables Before Preservation

GRANTEE OR CONTRACTOR:
National Canners Association
Research Foundation
1133 20th St., N.W.
Washington, D.C. 20036

EPA PROJECT OFFICER:
Harold Thompson
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Berkeley, California

DESCRIPTION OF PROJECT

Award Date: April 1, 1971

Project Cost: $137,505

Completion Date: October 1, 1972

Federal Cost: $86,108

Summary:

During the 18-month project period, steam, hot water, microwave, and hot-air pilot blanchers will be fabricated, leased, and installed at various canneries or freezing plants. A complete analysis of systems employed will be made to establish capital and operating costs, product quality, retention of nutrients, water consumption, and wastewater generation and characterization.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**

**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section 6(b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 HRR

TITLE OF PROJECT: "Protein Production from Acid Whey via Fermentation"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Amber Laboratories Division<br>Milbrew, Incorporated<br>Juneau, Wisconsin 53030 | Mr. Kenneth Dostal<br>Pacific Northwest Water Laboratory<br>Corvallis, Oregon |

Project Site: Juneau, Wisconsin

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | September 15, 1971 | Project Cost: | $251,549 |
| Completion Date: | July 15, 1972 | Federal Cost: | $ 95,490 |

Summary:

The objective of this 10 month project is to demonstrate an efficient acid whey fermentation process to recover protein by-products. The fermentation process will convert whole and deproteinized acid whey, in a 4,500 gallon/day batch reactor, to a feed product using Saccharomyces fragilis.

The fermentation will be accomplished by the use of closed vessel, deep tank fermentors to keep odors and vapors at a minimum. All process streams will be investigated for pollutional effects. Feed recovery systems will have a zero discharge and investigation dealing with development of human grade material will ascertain means of achieving 30 ppm $BOD_5$ in the final effluent.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12060 HCW

TITLE OF PROJECT: "Submerged Combustion Evaporation System for Concentration of Brewery Spent Grain Liquors"

GRANTEE OR CONTRACTOR:

Anheuser-Busch, Inc.
721 Pestalozzi Street
St. Louis, Missouri 63118

EPA PROJECT OFFICER:

Robert Hiller
South Central Regional Office
1402 Elm Street
Dallas, Texas 75202

Project Site: Houston, Texas

DESCRIPTION OF PROJECT

Award Date: Sept. 15, 1971

Project Cost: $498,817

Completion Date: Sept 14, 1972

Federal Cost: $ 78,630

Summary:

The objective of this project is to demonstrate the feasibility of concentrating brewery spent grain liquors with a submerged combustion evaporator. These liquors, resulting from screening and pressing operations, contain grain solids unrecoverable with conventional processes and are high in BOD and suspended solids content. In the proposed system, the spent grain liquors will be concentrated to such an extent that they may be either mixed with enough dried grain to be sent to the grain dryer, or sent to the dryer directly. The process will eliminate heavy waste loadings discharged to the sewer under current procedure and provide additional saleable dried grain.

Operating procedures will be developed which will result in optimum efficiency for the process. An effluent sampling program will be used to demonstrate the effect of the system on the total plant waste stream.

It is expected that the process should be applicable throughout the brewing industry and in other grain fermentation industries as well.

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 HPC

TITLE OF PROJECT: Pilot-Plant Treatment of Wine Stillage

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| California Dept. of Agriculture<br>Wine Advisory Board<br>717 Market Street<br>San Francisco, California 94103 | Robert Burm<br>Pacific Northwest Water Laboratory, EPA<br>Corvallis, Oregon |

Project Site: Davis, California (Build Unit)
Fresno, California (Run Unit)

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | July 30, 1971 | Project Cost: | $77,832 |
| Completion Date: | July 29, 1973 | Federal Cost: | $49,820 |

Summary:

This project will investigate, on a small pilot-plant scale, the aerobic and anaerobic treatment of California brandy stillage. In addition, direct fermentation of the pomace stream will be investigated to look for the most utilitarian method of removing this wastewater stream. Various grape varieties and their resulting compositional wastewater differences will be investigated theoretically and experimentally.

This project phase has, as its ultimate goal, the development of design criteria and standard treatment costs for anaerobic and aerobic wastewater treatment of brandy stillage.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 HVQ

TITLE OF PROJECT: "Utilization of Paunch Manure, as a By-Product Feed for Channel Catfish, and Its Effects on Water Quality"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Oklahoma State University<br>Stillwater, Oklahoma<br>74074 | Mr. John Witherow<br>EPA Southwest Water Laboratory<br>Ada, Oklohoma |

Project Site: Stillwater, Oklahoma

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | October 10, 1971 | Project Cost: | $30,497 |
| Completion Date: | June 30, 1973 | Federal Cost: | $26,600 |

Summary:

This project will determine utilization of optimum feed comprised of dried paunch manure for open pond and cage culture of channel catfish. Additionally, this project will ascertain the effects of this by-product feed on water quality in ponds.

The cage culture will be implemented by setting up three paunch manure blends consisting of 37.10, 34.20, 32.25 percent protein levels fed to three replications each of 333 fish in one acre ponds. Fish growth will be observed and weekly samples of discharge water will be studied. The pond culture will consist of four protein levels of 29.9, 27.8, 25.7 and 23.6 percent protein levels fed to two replications of 250 fish in 0.25 acre ponds and monitored weekly.

The Robert S. Kerr Research Center (EPA, Ada, Oklahoma) will do the standard ASTM analyses of the water collections. The OSU personnel will collect the samples weekly and monitor the DO, $CO_2$, pH and temperature.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801007

TITLE OF PROJECT: "Seafoods Processing Waste Water Characterization"

GRANTEE OR CONTRACTOR:
Oregon State University
Department of Food Science
and Technology
Corvallis, Oregon 97331

EPA PROJECT OFFICER:
Mr. Kenneth Dostal
Pacific Northwest Water Laboratory
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | Sept. 1, 1971 | Project Cost: | $38,069 |
| Completion Date: | June 30, 1972 | Federal Cost: | $35,187 |

Summary:

The Oregon State University Seafoods Laboratory proposes to employ a mobile waste water analytical laboratory on its premises in Astoria, Oregon, to monitor the wastes produced by six different seafoods processing plants. The ten month study will include categorization of tuna, bottom fish, crab, clams, shrimp, salmon, and by-products.

Using methods proven in previous mobile laboratory work and utilizing equipment already on hand, they will (with flow-proportioned composite samples whenever possible) monitor on site: 1) flow, 2) temperature, 3) dissolved oxygen, and 4) pH. After passage through a 20 mesh screen, the composite samples would be analyzed in the mobile facility for the following constituents: 5) total solids, 6) dissolved solids, 7) volatile solids, 8) settleable solids, 9) suspended solids, 10) chemical oxygen demand, 11) 5-day biochemical oxygen demand (at intervals), 12) ultimate biochemical oxygen demand (at intervals), and 13) oil and grease. In addition, a portion of each composite sample would be preserved and shipped to the O.S.U. Department of Food Science Waste Management Laboratory in Corvallis, Oregon, for complete nitrogen and phosphorus analysis.

Solid waste magnitudes will also be monitored. All results will be expressed in terms of production volume (e.g. lbs. $BOD_5$/ton raw product).

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6(b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800904

TITLE OF PROJECT: "Shrimp Canning Waste Treatment Study"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| American Shrimp Canners Asso. | Mr. Robert L. Hiller |
| P.O. Box 50774 | EPA Region XI |
| New Orleans, Louisiana 70150 | Dallas, Texas |

Project Site: Westwego, Louisiana

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: May 1, 1972 | Project Cost: 61,943 |
| Completion Date: Nov. 1, 1973 | Federal Cost: 41,217 |

Summary:

The general objectives of this grant are to conduct a study on a pilot plant scale, of waste water treatment for the Gulf Coast shrimp processing industry. Within this general objective there are the following specific objectives:

1. Characterize in a physical, chemical, and biological sense the waste water from a typical shrimp canning plant.

2. Measure the waste water stream flows from a typical shrimp canning plant.

3. Evaluate and recommend technical changes in the canning process operations to reduce waste water flows.

4. Perform pilot scale studies on typical shrimp canning wastes in order to develop specific design and operational criteria for selected treatment methods.

5. Determine the economics of various alternative procedures to capture and dispose of the solid wastes.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) *,*
*Federal Water Pollution Control Act (PL 84 660), as amended.*

PROJECT NUMBER: 800250

TITLE OF PROJECT: Continuous Hot Air Blanching of Vegetables

GRANTEE OR CONTRACTOR:
National Canners Association
Research Foundation
1133 20th Street N.W.
Washington, D.C. 20036

EPA PROJECT OFFICER:
Mr. Kenneth Dostal
Pacific Northwest Laboratory, EPA
200 S.W. 35th Street
Corvallis, Oregon [illegible]

Project Site:
Stockton, California & Salem, Oregon

DESCRIPTION OF PROJECT

Award Date:
April 1, 1972
Completion Date:
April 1, 1973

Project Cost:
$71,424
Federal Cost:
$49,892

Summary:

The primary objective of this project is to demonstrate the technical and economic feasibility of the hot air blanching process in the vegetable preserving industry for substantially reducing a major source of pollution and as a means of water conservation. Conventional hot water blanching is employed to inactivate enzymes prior to canning but generates large volumes of waste water with high BOD and solids content. The hot air blanching process which does not use water, inactivates enzymes by heat treatment with combusted gas in a plenum chamber producing only small volumes of steam condensate.

Pilot scale hot air blanching equipment will be modified to provide continuous operation at two processing facilities on five major volume commodities, (spinach, green peas, corn, green beans, and beets). Optimum operating conditions and costs will be determined from consecutive 8-hour runs. Product quality evaluations will be conducted and compared with conventional blanched products. In addition the volume of condensate will be measured and waste water characteristics (COD, ph, SS) determined.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800930

TITLE OF PROJECT: Recycling of Water in Poultry Processing Plants

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Pacific Egg and Poultry Assoc.<br>5420 Jefferson Blvd.<br>Los Angeles, California 90016 | Vern Tenney, EPA, Region IX<br>San Francisco, California |

Project Site: Livingston and Menlo Park, California

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 12,1972 | Project Cost: | $150,550 |
| Completion Date: | June 11, 1973 | Federal Cost: | $99,206 |

Summary:

The primary objective of this project is to conduct pilot scale studies to recycle chiller waste water at a rate of 500 gallons per minute following filtration and sterilization steps. The recycling system consists of a travelling screen to remove coarse solids, a cyclonic desludger for solids removal of particle sizes 100 Mu or larger, and an ultraviolet unit for sterilization. The latters irradiation will impart a minimum dosage of 30,000 micro watts/sq. cm. to the chiller water stream, well above the minimum to eliminate a major portion of viable pathogens and viruses. An analysis of BOD, total solids, oil and grease, iron, chlorides, total plate count, coliform count, salmonella incidence, poultry virus incidence, temperature and adsorption at 253.7 nm, will be conducted at appropriate time intervals and locations in the continuous chiller system. The principal site of the study will be at Foster Farms Inc., located in Livingston, California. This plant processes 180,000 birds per day in a two-shift, 15 hours, operation.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6(b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S800935

TITLE OF PROJECT: "Rum Distillery Waste Treatment by Anaerobic Digestion"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Bacardi Corporation<br>GPO Box 3549<br>San Juan, Puerto Rico<br>00936 | Mr. George Keeler<br>Headquarters, EPA<br>Paper and Food Products Industries Sectio<br>Washington, D.C. |

Project Site: San Juan, Puerto Rico

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: May 10, 1972 | Project Cost: $128,725 |
| Completion Date: May 9, 1973 | Federal Cost: $ 89,758 |

Summary:

The general objective of the Project is to continue the investigation and development of an anaerobic digestion process for the treatment of rum distillery effluent on a pilot plant scale. Within this general objective there are the following specific objectives:

a. To install and operate a 500 gallon anaerobic digestion pilot plant;

b. To determine the optimum operating parameters for the anaerobic digestion process and to determine the variations in process efficiency as a function of these parameters;

c. To conduct limited bench scale investigations of an anaerobic reaction process using controlled cell separation and recycle;

d. To verify the applicability of proposed kinetic equations to describe the process and to determine the values of the kinetic constants;

e. To establish design criteria and to develop a preliminary engineering design for the full-scale process; and

f. To estimate capital, operation and maintenance costs for a plant-scale installation.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

### ENVIRONMENTAL PROTECTION AGENCY
### RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12060 FDK

TITLE OF PROJECT: ADM Company Wastewater Treatment

GRANTEE OR CONTRACTOR:
Archer Daniels Midland Company
4666 Faries Parkway
Decatur, Illinois 62525

EPA PROJECT OFFICER:
Clifford Risley
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Decatur, Illinois

DESCRIPTION OF PROJECT

Award Date: March 16, 1970 Project Cost: $245,254

Completion Date: September 15, 1971 Federal Cost: $106,677

Summary:

A full-scale (~0-5 mgd) development-demonstration project for emulsion breaking of the effluent wastewaters resulting from soybean processing for oil will be undertaken. The project will develop and install the required additional facilities to break tight emulsions currently being discharged to a municipal sewer system. The existing system contains an oil separator-skimmer and 1-day retention lagoon. To be explored will be primarily a two-stage chemical system, with other physical and biological alternatives also to be evaluated. Also to be demonstrated is an ion exchange system for sodium removal and wash water recovery, as researched by the USDA.

# PPB 12070

# MACHINERY AND TRANSPORTATION EQUIPMENT MANUFACTURING

Industrial activities in the Standard Industrial Classification (SIC) Groups 35 (Machinery), 36 (Electrical Machinery), and 37 (Transportation Equipment) are included in this subprogram element. Combined water usage is approximately 4.4 billion gallons per day or 4.5 per cent of industrial water use. Approximately 0.38 billion gallons per day is used in processing operations. Oil, particulate matter, and cleaners constitute the principal contaminants in wastewaters that arise in processes other than finishing operations. The physical process of sedimentation, flotation, and chemical neturalization are the most frequently employed treatment methods. Metal finishing operations, waste characteristics, and treatment methods and objectives are similar to those described for PPB 12010. Grant project priorities and objectives are as described on page 2-1 introductory material relative to PPB 1201. This program area (other than electroplating) is implemented by Dr. Hugh B. Durham. The program on electroplating is implemented by Mr. John Ciancia. The contacts for these individuals are indicated on page 2-1.

PROJECT INDEX

PPB 12070 - MACHINERY AND TRANSPORTATION EQUIPMENT MANUFACTURING

| 12070 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| WPD 117 | The Johns Hopkins University | B | 8-5 |
| HEK | The Boeing Company | C | 8-6 |
| HGH | Grumman Aerospace Corp. | C | 8-7 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

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# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Demonstration , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPD 117-03 (PPB 12070)

TITLE OF PROJECT: Management of Recycled Waste-Process Water Ponds

GRANTEE OR CONTRACTOR:
Dr. Charles E. Renn
Department of Environmental Engineering Science
The Johns-Hopkins University
Baltimore, Maryland 21218
Project Site: Hampstead, Maryland

EPA PROJECT OFFICER:
Dr. Herbert Skovronek
Industrial Waste Treatment Branch
Edison Water Quality Research Division
Edison, New Jersey 08817

DESCRIPTION OF PROJECT

Award Date: December 1, 1967
Project Cost: $180,921 (3rd year)

Completion Date: November 30, 1968
Federal Cost: $39,627 (3rd year)

Summary:

The purpose of this project is to develop detailed information on the operational techniques required to permit the utilization of a limited supply of treated domestic wastewaters for a variety of manufacturing processes. Requirements for control of biological processes in wastewaters impounded and recycled extensively within manufacturing processes and operations are being investigated.

The project is being conducted at the Black and Decker Manufacturing Co. plant located in Hampstead, Md. Operations in the plant involve stamping, pressing, punching, grinding, forging, assembly, and performance testing in a controlled environment requiring 2600 tons of refrigeration for air conditioning during the warm months. The water supply from wells is very limited. Domestic wastewaters are treated and routed to a nine-acre impoundment for recirculation through the plant processes and operations. A "no-additional-cost" time extension has been requested to permit further evaluation through another summer season.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12070 HEK

TITLE OF PROJECT: Regeneration of Chromated Aluminum Deoxidizer Solutions

GRANTEE OR CONTRACTOR:
The Boeing Company
Commercial Airplane Group
P.O. Box 3707
Seattle, Washington 98124

EPA PROJECT OFFICER:
Dr. Hugh B. Durham
Industrial Waste Treatment Research Program
Environmental Protection Agency
Crosse Ile, Michigan 48138

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

Award Date: August 1, 1971 Project Cost: $61,300

Completion Date: August 1, 1973 Federal Cost: $30,650

Summary:

Preliminary research work indicates that it is feasible to regenerate chromate deoxidizer solutions thus offering an alternative to the periodic dumping of the spent or contaminated bath. By applying chemical engineering technology this project will attempt to demonstrate that it is possible to maintain acceptable performance of these solutions indefinitely. By making this technology available to all metal finishers, a significant reduction in total chromium waste discharges can be achieved. Preliminary studies and tests have indicated that regeneration costs will be considerably less than disposal and replacement costs.

The proposed treatment method involves electrolytic regeneration of the active compounds and cooling to remove the reaction products and bath impurities by precipitation and filtration.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) *,*
*Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12070 HGH

TITLE OF PROJECT: Treatment and Recovery of Fluoride Industrial Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Grumman Aerospace Corp.<br>Bethpage, New York 11714 | John Ciancia, Chief<br>Industrial Research Technology Branch<br>Edison Water Quality Research Division, EPA<br>Edison, New Jersey 08817 |

Project Site: Bethpage, New York

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: December 1, 1971 | Project Cost: $55,978 |
| Completion Date: November 30, 1972 | Federal Cost: $34,922 |

Summary:

A laboratory and pilot plant investigation will be conducted on metal processing wastes to develop fluoride treatment and recovery technology. The approach will involve the use of precipitation (primary and secondary) and ion exchange, either alone or in combination, to achieve various levels of fluoride in the treated effluent. The study will include determining the best precipitating agents, ion exchange medium, and liquid solid separation technique, as well as parameter optimization and equipment selection. An evaluation of the economics and effectiveness of the system will be made on the basis of the pilot-plant demonstration.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# PPB 12080

# STONE, CLAY, AND GLASS PRODUCTS

In the manufacture of the stone, clay and glass products, the main constituents are nonmetallic minerals. As a consequence, the processing of these nonmetals into manufactured products results in wastes composed of sediments and suspensions ranging in size from coarse to extremely fine. Further, depending upon the end product, the constituent material, and the equipment, ingredients, and process of manufacture, there results a varied and voluminous waste stream. This wastewater may transport or combine with, in addition to the material being processed, the chemicals, abrasives, lubricants, metals or other expended materials used in the various manufacturing operations.

The comments which follow are made to indicate the scope and variety of manufacturing operations among the almost 20,000 industrial establishments involved in the manufacture of products of stone, clay, glass and concrete. The manufacture of portland cement and the processing of coarse and fine aggregate, as well as the combination of all three with water to form concrete products, result in an extremely large volume of wastewater. There are nearly 300 cement plants and almost 5000 ready-mix or transit-mix concrete plants, together with site-located concrete-making plants numbering over 6000.

The manufacture of brick and structural tile, ceramic wall and floor tile, and vitreous bathroom, kitchen, and table-ware involves nearly 1000 other installations where process and wash waters add to the pollutional load. Other building and construction materials such as lime and gypsum products and cut-stone products are produced by almost 1500 plants. Glass in the form of sheets, containers, and other glassware, together with the items made from purchased glass, account for another 1500 or more manufacturers, many with similar and some with unique pollution problems. The manufacturers of abrasive and asbestos products, gaskets, packing, insulation and nonmetallic mineral products constitute another large segment of industrial activity which contributes to the water pollution problem.

For industries of the type mentioned, the wastes are varied and voluminous. The research, development, and demonstration of processes for the separation, movement, and disposal or reprocessing of these wastes comprise the main objectives. This requires a determination of the quality and quantity of waste produced, the development of treatment procedures where none exist, and the upgrading of existing treatment procedures. Among the anticipated results is the implementation of new, feasible treatment methods leading to reduced treatment costs, reduced water use, renovation and reuse of water and by-product recovery.

# PROJECT INDEX

## PPB 12080 - STONE, CLAY, AND GLASS PRODUCTS

| 12080 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| HBM | Oregon Concrete and Aggregate Producers Association | B | 9-8 |
| EZF | Johns - Manville Products Corporation | A | 9-9 |
| GCH | Vermont Department of Water Resources | B | 9-10 |

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*Project Status:
- A - Completed, Final Report Available
- B - Final Report in Preparation
- C - Work Continuing
- D - Project Terminated

## FINAL PROJECT REPORTS

## PPB 12080 - STONE, CLAY, AND GLASS PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12080 EZF 09/70 | Phenolic Water Reuse by Diatomite Filtration, Johns-Manville Products Corporation, Manville, New Jersey. | GPO - $1.25 |

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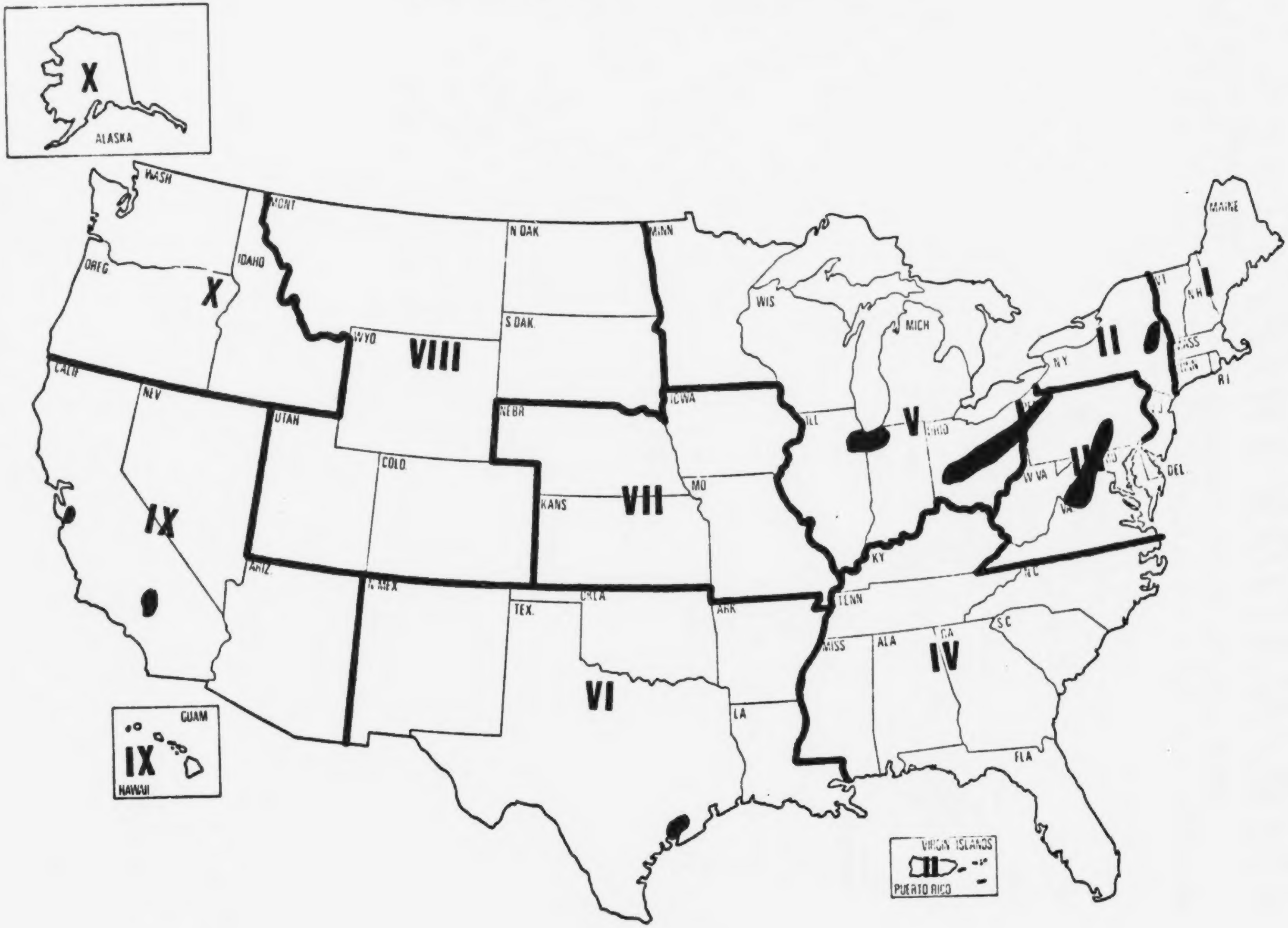
LOCATION OF HYDRAULIC CEMENT INDUSTRY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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12080 HBM

TITLE OF PROJECT: State-of-the-Art of Ready Mix, Concrete and Aggregate Production

GRANTEE OR CONTRACTOR:
Oregon Concrete and Aggregate Producers Association
11800 S. W. Fairfield
Beaverton, Oregon

EPA PROJECT OFFICER:
Edward G. Shdo
Region X, EPA
1200 Sixth Avenue
Seattle, Washington 98101

Project Site: Beaverton, Oregon 97005

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 30, 1971 | Project Cost: | $27,400 |
| Completion Date: | March 1, 1972 | Federal Cost: | $23,600 |

Summary:

The study will involve the gathering of data to determine the kind and extent of present treatment methods for process water used in aggregate production. It will investigate the impact of the associated pollution problem and detail existing treatment techniques. Information on pollution loads, plant sizes, removal efficiencies, and construction and operating costs will be reported. Gaps in technology will be identified and recommendations for research and priorities will be made directed towards abatement of water pollution and recycling of the process waters.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12080 EZF

TITLE OF PROJECT: Phenolic Wastewater Reuse by Diatomite Filtration

GRANTEE OR CONTRACTOR:
Johns-Manville Products Corp.
Manville, New Jersey

EPA PROJECT OFFICER:
Charles H. Ris
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Defiance, Ohio

DESCRIPTION OF PROJECT

Award Date: September 1, 1967 Project Cost: $164,700

Completion Date: September 1, 1970 Federal Cost: $82,350

Summary:

The fiberglass industry has long had a problem in disposing of wastewater containing phenolic resins. In the fiberglass manufacturing process, airborne glass fibers are sprayed with a phenolic resin as the fiber blanket is formed on the collecting conveyor, causing a deposit of resin to form on the conveyor chain. Prompt cleaning before the deposit sets is needed to permit continuous formation of the glass fiber mat. The wastewater originates from the chain washing operation which uses either a caustic wash or high volume showers to remove the resin deposits.

Under the demonstration project a chain cleaning - water reuse system was installed which consists of low-volume, high-pressure chain cleaning units with water consumption of eight gallons per minute at 1000 psi, two stages of primary filtration to remove large particles and fiber, and a secondary diatomite filter to remove fine particulate matter. The filtered water is suitable for reuse in the binder batch, overspray system, and the chain cleaning units.

The water reuse system has reduced the quantity of water required for chain cleaning, will use water 4.5 times before evaporation removes it from the system, requires 1 lb of diatomite per 500 gallons of resin-bearing water filtered, and provides water at a net cost of $.37/1000 gallons -vs- $.75/1000 gallons for city water.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12080 GCH

TITLE OF PROJECT: Granite Industry Wastewater Treatment

GRANTEE OR CONTRACTOR:
Vermont Department of Water Resources
Montpelier, Vermont 05602

EPA PROJECT OFFICER:
Allyn Richardson
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: University of Vermont
Burlington, Vermont 05401

DESCRIPTION OF PROJECT

Award Date: September 1, 1970 Project Cost: $87,868

Completion Date: November 30, 1971 Federal Cost: $61,508

Summary:

The purpose is to develop and demonstrate a system capable of abating the water pollution generated in granite processing.

Included are studies to optimize industry operations, determine process water demands, and verify wastewater characteristics. The development of solids-liquid separation techniques are included, as well as the analysis of supernatants and sludges aimed at the clarification of the former and the disposal or reprocessing of the latter.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# PPB 12090

# TEXTILE MILL PRODUCTS

The R&D program for the textile industry receives support under the EPA grant and contract monies from Section 5 and Section 6 of the Clean Water Restoration Act of 1966. The objectives of the program are to:

1. Define the water pollution problem as it pertains to the textile industry.
2. Research, develop, and demonstrate the required technology to achieve at minimum cost the equivalent of 85 per cent and 99 per cent removal of contaminants and the technology to achieve water reuse.

The objectives are met through the awarding of grants and contracts to universities, industries, and municipalities and through in-house research activities carried out by the Southeast Water Laboratory.

The wastewater flows may be identified with the following textile fibers and processing operations:

1. Cotton: sizing, desizing, scouring, bleaching, mercerizing, dyeing, printing, and finishing.
2. Wool: scouring, dyeing, washing, carbonizing, and bleaching.
3. Noncellulose chemical fiber: scouring, dyeing, bleaching, and special finishing.
4. Cellulose chemical fiber: chemical preparation, scouring, dyeing, bleaching, and special finishing.

In 1968 the textile industry, as defined by SIC codes 221-223, 225-229/2823 and 2824, used 1127 billion gallons of water for the manufacturing processes. The fresh water intake was approximately 498 billion gallons, the consumption was 37 billion gallons and the industry had a water reuse factor of 2.3.

## PROJECT INDEX

## PPB 12090 - TEXTILE MILL PRODUCTS

| 12090 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| ECU | North Carolina State University | D | 10-8 |
| ECS | Clemson University | A | 10-9 |
| EOX | Clemson University | B | 10-10 |
| EOE | North Carolina State University | A | 10-11 |
| FWD | American Association of Textile Chemists and Colorists | B | 10-12 |
| FZB | Georgia Institute of Technology | A | 10-13 |
| EUX | Fiber Industries, Inc. | A | 10-14 |
| ESG | American Enka Corporation | A | 10-15 |
| DWM | C.H. Masland and Sons | A | 10-16 |
| EQO | Palisades Industries, Inc. | B | 10-17 |
| GW | Holliston Mills, Inc. | C | 10-18 |
| GIZ | Southern Dyestuff Company | C | 10-19 |
| HLO | Cone Mills Corporation | C | 10-20 |
| PCO | Beaunit | C | 10-21 |
| 800852 | Canton Textile Mills | C | 10-22 |
| 800294 | North Carolina State University | C | 10-23 |
| 800929 | LaFrance Industries | C | 10-24 |
| 801192 | Blue-Ridge Winkler Textiles | C | 10-25 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C — Work Continuing
D - Project Terminated

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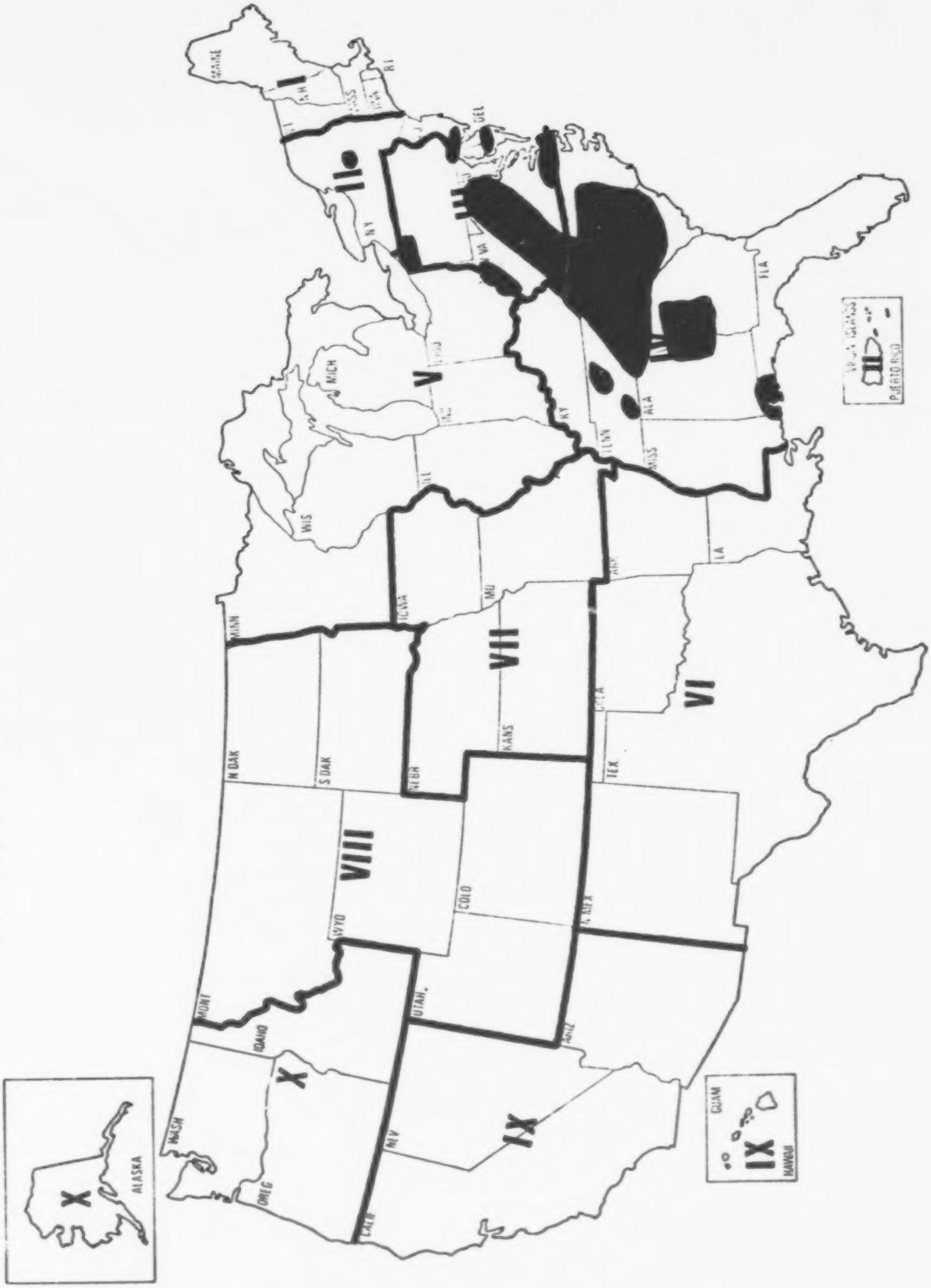
## FINAL REPORTS AVAILABLE

### PPB 12090 - TEXTILE MILL PRODUCTS

| Report Number | Title/Author | Source |
|---|---|---|
| 12090 EUX 10/70 | Reuse of Chemical Fiber Plant Waste Water and Cooling Water Blowdown, Fiber Industries, Inc., Charlotte, North Carolina, and Davis and Floyd Engineers Inc., Greenwood, South Carolina. | GPO - 70¢ |
| 12090 DWM 01/71 | Bio-Regenerated Activated Carbon Treatment of Textile Dye Waste Water, C.H. Masland and Sons, Wakefield, Rhode Island. | GPO - $1.00 |
| 12090 ESG 01/71 | Fine Precipitation and Recovery Viscose Rayon Waste Water, American Enka Company, Enka, North Carolina. | GPO - $1.00 |
| 12090 ECS 02/71 | State-of-the-Art of Textile Waste Treatment, Clemson University, Clemson, South Carolina. | GPO - $2.50 |
| 12090 EOE 01/72 | Water Pollution Reduction Through Recovery of Desizing Wastes; by Dept. of Textile Chemistry, North Carolina State University, Raleigh, NC | GPO - 60¢ |
| 12090 FZB 07/71 | Dyestuff Color Removal by Ionizing Radiation and Chemical Oxidation; T. F. Craft, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA 30337 | GPO - |

LOCATION OF MAJOR FIBER & FINISHING INDUSTRIES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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 ECU

TITLE OF PROJECT: Textile Based Water Pollution-Information Study

GRANTEE OR CONTRACTOR:
Department of Textile Chemistry
North Carolina State University
Raleigh, North Carolina 27607

EPA PROJECT OFFICER:
Harold Snyder
Oil and Hazardous Materials Program
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: May 9, 1969

Project Cost: $12,638

Completion Date: June 8, 1971

Federal Cost: $10,410

Summary:

This project involves the collection, abstracting and indexing of all available literature dealing with water pollution from textile based sources and the preparation and storage of this information into the Water Resources Scientific Information System. Information will also be correlated between the Water Resources Scientific Information Center, USDI, the M.I.T. Textile Center, and the Shirley Institute thesauri.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 ECS

TITLE OF PROJECT: Survey of the State-of-the-Art of Textile Waste Treatment

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Textiles | Thomas N. Sargent |
| School of IM & TS | Southeast Water Laboratory, EPA |
| Clemson University | College Station Road |
| Clemson, South Carolina 29631 | Athens, Georgia 30601 |

Project Site: Clemson, South Carolina

DESCRIPTION OF PROJECT

Award Date: June 24, 1969 Project Cost: $31,675

Completion Date: March 30, 1971 Federal Cost: $30,007

Summary:

The study will include characterization of the liquid wastes from the major manufacturing processes with respect to composition and quantity per unit of production, identification of successful and unsuccessful treatment processes and disposal practices presently in use, and suggestion of alternatives for least satisfactory practices. The study will be directed towards identifying areas most in need of research and those areas where research effort is most likely to yield beneficial results.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 EOX

TITLE OF PROJECT: A Study of the Photochemical Degradation of Commercial Dyes

GRANTEE OR CONTRACTOR:
Department of Textiles
Clemson University
Clemson, South Carolina

EPA PROJECT OFFICER:
Dr. A. W. Garrison
Southeast Water Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Clemson, South Carolina

DESCRIPTION OF PROJECT

Award Date: August 20, 1969

Project Cost: $34,040

Completion Date: May 31, 1971

Federal Cost: $31,539

Summary:

The objectives of this 12-month research project are to define and characterize the products of decomposition resulting from ultraviolet radiation of selected commercial textile dyes. The characterization will include distinguishing between photochemical and hydrolytically produced decomposition products.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 EOE

TITLE OF PROJECT: Water Pollution Reduction Through Recovery of Desizing Wastes

GRANTEE OR CONTRACTOR:
Department of Textile Chemistry
North Carolina State University
Raleigh, North Carolina 27606

EPA PROJECT OFFICER:
Harold Snyder
Oil and Hazardous Materials Program
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: October 6, 1969 | Project Cost: $39,688 |
| Completion Date: August 5, 1971 | Federal Cost: $35,833 |

Summary:

The objectives of this 12-month research project are to investigate processes for the recovery of desizing wastes in solid or concentrated form suitable for disposal and to investigate processes for the recovery of desizing wastes in a reusable form. The wastes studied will be those from fabrics sized with carboxymethylcellulose (CMC), polyvinyl alcohol (PVA), and starch. In addition, data will be collected concerning the biodegradability of the synthetic sizes.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section 5 Demonstration, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 FWD

TITLE OF PROJECT: A Study of Gamma Induced Oxidation of Textile Effluents

GRANTEE OR CONTRACTOR:
American Assoc. of Textile
Chemists and Colorists
P.O. Box 12215
Research Triangle Park,
North Carolina

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Oak Ridge, Tennessee

DESCRIPTION OF PROJECT

Award Date: May 13, 1970

Project Cost: $50,000

Completion Date: September 12, 1971

Federal Cost: $47,500

Summary:

During the project period, work will be initiated to further develop and optimize a high-pressure, radiolytic oxidation system. The oxidation system is of laboratory-scale size and has initially been involved in joint FWQA/ORNL (Oak Ridge National Laboratory) experiments. Textile mill wastes, such as dyes, special finishing compounds, and other refractory wastes, will be subjected to the treatment system. Information from the pilot-scale demonstration will be collected concerning optimum operating conditions, radiation dose, temperature, pressure, and cost of treatment for various types and concentrations of waste.

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Research , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 FZB

TITLE OF PROJECT: Dyestuff Color Removal by Ionizing Radiation and Chemical Oxidation

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Engineering Experiment Station<br>Georgia Institute of Technology<br>Atlanta, Georgia 30332 | Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street, N.E.<br>Atlanta, Georgia 30309 |

Project Site: Atlanta, Georgia

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | October 16, 1970 | Project Cost: | $37,685 |
| Completion Date: | October 15, 1971 | Federal Cost: | $35,801 |

Summary:

This 12-month project will investigate the feasibility of a method of treatment dependent on the effects of a combination of ionizing radiation and variety of chemical oxidants on textile dye wastes. The degraded products will be examined with regard to BOD, COD, TOC, color removal, biodegradability, and toxicity to treatment plant biota. A conceptual engineering design will be proposed and a preliminary estimate of treatment costs for a typical dye waste will be made.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 EUX

TITLE OF PROJECT: Reuse of Chemical Fiber Plant Wastewater and Cooling Water Blowdown

GRANTEE OR CONTRACTOR:
Fiber Industries, Inc.
Box 10038
Charlotte, North Carolina 28201

EPA PROJECT OFFICER:
R. Thacker
Pollution Control Analysis Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Shelby, North Carolina

DESCRIPTION OF PROJECT

Award Date: April 18, 1968 Project Cost: $500,000

Completion Date: September 17, 1970 Federal Cost: $350,000

Summary:

Demonstration studies were conducted to determine the feasibility of reusing industrial and domestic wastewaters from a FORTREL Polyester manufacturing plant. The wastewaters consisted of organic chemical process wastes, cooling system blowdown, and domestic wastewaters from the plant. Selected unit processes and operations were superimposed on an existing activated sludge system in an effort to improve the quality of the treated discharge. The cooling system blowdown was pretreated with sulfur dioxide in an acidic environment to remove the chromium. The cooling water biocides which passed through the chromium reduction unit were observed for their possible effect on the biological treatment system. A plastic media trickling filter was evaluated for its effectiveness as a roughing filter ahead of an activated sludge unit. The effluent from the secondary treatment system was filtered through a microscreen and treated with polymers and/or carbon to remove color, COD, dissolved and suspended solids.

The results of these studies indicate that chromium can be removed from the cooling tower blowdown for 21¢ per pound of chromate and that the type and concentration of biocides normally used in cooling water are either destroyed in the chromate reduction system or exhibit no adverse effect on the secondary and tertiary treatment system. The plastic media trickling filter operated with a sludge recycle from the clarifier and reduced the BOD by 40 per cent. The 0.33 mgd industrial and domestic wastewater can be treated and reused at a rate of 0.10 mgd for approximately 40¢/1000 gals.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 ESG

TITLE OF PROJECT: Zinc Precipitation and Recovery from Viscose Rayon Wastewater

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| American Enka Corporation<br>Enka, North Carolina | Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street, N.E.<br>Atlanta, Georgia 30309 |

Project Site: Enka, North Carolina

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | May 24, 1968 | Project Cost: | $980,417 |
| Completion Date: | January 23, 1971 | Federal Cost: | $282,700 |

Summary:

In May, 1968, the Industrial Pollution Control Branch of the Water Quality Office of the Environmental Protection Agency initiated a research and development grant with American Enka Company to perfect an improved process for the precipitation and recovery of soluble zinc in rayon manufacturing wastewaters.

In the production of viscose rayon, zinc sulfate is used as a component of the acid spinning bath. Zinc is lost in a dilute form at points where the acid spun yarns are washed with water and at various points in the spinning bath system. The novel zinc recovery system involves initial neutralization of the waste stream to pH 6.0, sedimentation of insolubles, crystallization of zinc hydroxide in a high pH environment, sedimentation of zinc hydroxide, and solubilization of the zinc with sulfuric acid.

This novel recovery system was operated at a 600 - 1000 gpm rate with 70 - 120 mg/l of Zn in the feedwater. The system can maintain an effluent concentration of Zn less than 1 mg/l, which corresponds to 98 - 99 per cent removal efficiency. The unique zinc hydroxide sludge is easily concentrated to 5 - 7 per cent solids by sedimentation and to 10 per cent solids by centrifugation. The sludge particles obtained by this process are spheroids of 4 - 8 microns average diameter, while normally precipitated sludge particles resemble curved platelets about 2 microns in diameter.

A daily recovery of 2,000 pounds of zinc assures recovery of the 12.5 to 14.0 ¢/lb of Zn operating and maintenance costs. The cost of zinc oxide purchased by Enka amounts to 15.6 ¢/lb of equivalent Zn.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 DWM

TITLE OF PROJECT: Bio-Regenerated Activated Carbon Treatment of Textile Dye Wastewater

GRANTEE OR CONTRACTOR:
C. H. Masland & Sons
Wakefield, Rhode Island

EPA PROJECT OFFICER:
Donald R. Smith
New England Basins Office, EPA
240 Highland Ave.
Needham Heights, Massachusetts 02194

Project Site: Wakefield, Rhode Island

DESCRIPTION OF PROJECT

Award Date: April 15, 1969 Project Cost: $39,450

Completion Date: January 14, 1971 Federal Cost: $27,615

Summary:

In the final report to this project a novel approach to treating a highly colored textile dyeing waste effluent is described. It comprises the removal by sorption of color bodies and other organic matter on activated carbon granules. Spent carbon granules are then subjected to a virule aerobic biological culture which desorbs and bio-oxidizes the desorbed matter, thereby regenerating the carbon for subsequent new sorption steps.

Laboratory confirmation of the phenomenon is presented in the final report. Field testing of the treatment process concept in a 50,000-gpd plant installed at a yarn spinning mill (C.H. Masland & Sons, Wakefield, Rhode Island) is also reviewed.

Color removal was virtually complete at two flow rates evaluated: 8.5 gpm/sq.ft. and 15.6 gpm/sq.ft. carbon column bed flow. TOC removal was 85 per cent or higher at 8.5 gpm/sq.ft. and only 48 per cent at 15.6 gpm/sq.ft.

It was demonstrated that activated carbon had an adsorption capacity in excess of 3/4 pound TOC per pound of carbon when the carbon was reactivated only by biological means. The estimated operating cost for decolorizing 1,000,000 gpd is 8.3 cents/1000 gallons.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 EQO

TITLE OF PROJECT: Demonstration of a New Process for the Treatment of High Pollutant Concentration Textile and Finishing Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Palisades Industries, Inc.<br>2 Columbia Street<br>Peace Dale, Rhode Island 02883 | Donald R. Smith<br>New England Basins Office, EPA<br>240 Highland Ave.<br>Needham Heights, Massachusetts 02194 |

Project Site: Peace Dale, Rhode Island

DESCRIPTION OF PROJECT

Award Date: October 3, 1969 Project Cost: $143,750

Completion Date: September 2, 1971 Federal Cost: $64,687

Summary:

The project will demonstrate the effectiveness of a pilot-scale treatment system which would adequately treat a 50,000-gpd waste flow from a textile dye mill. The system consists of an aerated equalization basin, an anaerobic activated carbon unit, an aerobic activated carbon unit and an activated sludge regeneration unit.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 EGW

TITLE OF PROJECT: Treatment of Cotton Textile Waste by Enzymes and High Rate Trickling Filter System

GRANTEE OR CONTRACTOR:
Holliston Mills, Inc.
111 Lenox Street
Norwood, Massachusetts 02060

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: New Canton, Tennessee 37662

DESCRIPTION OF PROJECT

Award Date: December 12, 1969 Project Cost: $285,372

Completion Date: December 31, 1972 Federal Cost: $144,741

Summary:

The industry concerned purchases cotton greige goods and produces high-grade book bindings. The manufacturing processes which produce a waste flow are desizing, caustic extraction, bleaching, dyeing, and sizing. The applicant proposes to substitute an enzyme desizing chemical in the desizing process which will reduce the pH and BOD load of the waste stream. A treatment system employing a primary clarifier, high-rate trickling filter with plastic media, and a secondary clarifier will be used to treat the waste flow. The sludge from the treatment system will then be subjected to an enzyme reaction which will render it amenable to further biological oxidation.

The effectiveness of the manufacturing process change and the operating characteristics and efficiency of the trickling filter and sludge handling system will be evaluated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 GIZ

TITLE OF PROJECT: Biological Oxidation and Chemical Coagulation of Dyestuff and Organic Chemical Wastes

GRANTEE OR CONTRACTOR:
Southern Dyestuff Company
Division of Martin Marietta Corp.
P.O. Box 10098
Charlotte, North Carolina 28201

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Charlotte, North Carolina

DESCRIPTION OF PROJECT

Award Date: February 26, 1971 Project Cost: $1,515,900

Completion Date: July 26, 1973 Federal Cost: $501,122

Summary:

The grantee will design, construct, operate, and evaluate a waste treatment system for the control of wastes from a textile dyestuff and organic chemicals plant. The plant produces over 200 different dyestuff products and more than 40 aromatic organic chemicals. The plant will be designed to handle a flow of 2.2 mgd with a BOD of 760 mg/l, a COD of 1750 mg/l, suspended solids of 350 mg/l, and a high color content. The waste treatment system consists of biological decomposition of a thiosulfate waste stream, pH control of acid and alkaline waste streams, and biological oxidation, coagulation and clarification of the combined wastes. The system will be operated for a 12-month period in order to determine the unit process operating parameters and system characteristics.

In addition, pilot-plant studies will be conducted to determine the basic design factors needed to upgrade the system's treatment capabilities for color removal.

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6(b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12090 HLO

TITLE OF PROJECT: Catalyzed Bio-oxidation and Clarification of Integrated Textile Wastes for Process Water REuse

GRANTEE OR CONTRACTOR:
Cone Mills Corporation
Greensboro, North Carolina 27405

EPA PROJECT OFFICER:
Mr. Thomas Sargent
Southeast Water Laboratory
College Station Road
Athens, GA 30601

Project Site:Greensboro, North Carolina

DESCRIPTION OF PROJECT

Award Date: August 17, 1971 Project Cost: $115, 250

Completion Date:September 17, 1972 Federal Cost: $ 79,415

Summary:

In an effort to satisfy stream water quality standards of 99% $BOD_5$ reduction, a 99+% nitrogen and phosphate reduction, and a 98% and 96% reduction in COD and suspended solids respectively, the grantee will design, operate and evaluate a pilot scale system to achieve these tertiary levels of treatment. During this 13 month project, three variations of an activated carbon catalyzed bio-oxidation process will be evaluated. The variations involve the use of various coagulant aids.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12090 PCO

TITLE OF PROJECT: Activated Sludge Treatment of Nylon Wastewaters Using Enriched Air

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Beaunit Fibers<br>Etowah, Tennessee 37331 | Thomas N. Sargent<br>Southeast Water Laboratory<br>College Station Rd.<br>Athens, Georgia 30601 |

Project Site: Etowah, Tennessee

DESCRIPTION OF PROJECT

Award Date: February 25, 1972 Project Cost: $338,807

Completion Date: June 1, 1973 Federal Cost: $136,927

Summary:

The grantee will design, construct and operate an activated sludge system for the treatment of Nylon 6.6 wastewaters. The activated sludge will be aerated using off gases from the manufacturing process containing 40% available oxygen. The system will be designed for a 150,000 gpd flow with a biochemical osygen demand of 1124 pounds per day. Water Quality Standards require that the system operate with removal efficiencies in excess of 92%

The treatment system will be operated for a 12 month period during which time raw waste characteristics, treatment process parameters and cost of treatment will be monitored and evaluated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800852

TITLE OF PROJECT: Optimum Treatment of Textile Finishing Wastes - Neutralization and Color Reduction

GRANTEE OR CONTRACTOR:
Canton Textile Mills
Canton, Georgia 30114

EPA PROJECT OFFICER:
Thomas N. Sargent
Southeast Water Laboratory
College Station Rd.
Athens, Georgia 30601

Project Site: Canton, Georgia

DESCRIPTION OF PROJECT

Award Date: April 3, 1972

Project Cost: $364, 511

Completion Date: October 2, 1973

Federal Cost: $209,811

Summary:

Canton Textile Mills will demonstrate a system whereby the biological oxidation of textile finishing wastes will be supplemented with flue gas neutralization of the waste stream for control of pH, and fly ash adsorption for the control of color. The pretreatment and tertiary treatment processes will augment an optimized biological oxidation system capable of producing an effluent of 30 mg/l BOD & SS. The entire waste treatment system will be designed to treat a 550,000 gallon per day waste flow and will be operated for a 12 month period during which time operating characteristics will be documented and evaluated.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800294

TITLE OF PROJECT: Recovery and Reuse of Synthetic Size from Textile Finishing Wastewaters

GRANTEE OR CONTRACTOR:
Department of Textile Chemistry
North Carolina State University
Raleigh, North Carolina 27607

EPA PROJECT OFFICER:
Thomas N. Sargent
Southeast Water Laboratory
Environmental Protection Agency
College Station Road
Athens, Georgia 30601

Project Site: Raleigh, North Carolina

DESCRIPTION OF PROJECT

Award Date: February 23, 1972

Project Cost: $72,771

Completion Date: February 22, 1973

Federal Cost: $48,043

Summary:

The objective of this 12 month project is to demonstrate in pilot scale, a process for the removal and recovery of carboxymethyl cellulose size from textile finishing wastewaters. Previous studies under EPA Grant Project 12090 EOE have identified the technical and economic feasibility of removing, recovering and reusing the CMC size. The size will be removed from dilute concentrations by chemical precipitation using alum. Reuse tests will be conducted to further evaluate and demonstrate the reuse potential of the recovered material. A final report will be prepared concerning all aspects of the project.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6(b), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 800929

TITLE OF PROJECT: Treatment and Reuse of Textile DyeHouse Wastewaters Using Reverse Osmosis

GRANTEE OR CONTRACTOR:
LaFrance Industries
LaFrance, South Carolina 29631

EPA PROJECT OFFICER:
Thomas N. Sargent
ORM-EPA
Southeast Water Laboratory
College Station Rd.
Athens, Georgia 30601

Project Site: LaFrance, SC

DESCRIPTION OF PROJECT

Award Date: June 12, 1972

Project Cost: $293,350

Completion Date: February 11, 1974

Federal Cost: $198,812

Summary:

This 20 month project will demonstrate in pilot scale the technical feasibility of employing membrane technology for the treatment and control of textile dyehouse wastewaters. Pilot scale reverse osmosis units will evaluate the use of cellulose acetate and dynamic membrane systems for the separation of dissolved solids and color concnetrates. The resulting retentate and permeate from the membrane units will be evaluated for recycle and reuse potential in the dyeing processes.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section 6(b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801192

TITLE OF PROJECT: Activated Sludge and Alum Precipitation of Textile Dye and Finishing Wastewaters

GRANTEE OR CONTRACTOR:
Blue Ridge-Winkler Textiles
Bangor, Pennsylvania 18013

EPA PROJECT OFFICER:
Thomas N. Sargent
ORM-EPA
Southeast Water Laboratory
College Station Road
Athens, Georgia 30601

Project Site: Bangor, Pennsylvania

DESCRIPTION OF PROJECT

Award Date: June 22, 1972

Project Cost: $264,615

Completion Date: September 21, 1973

Federal Cost: $ 96,156

Summary:

This 15 month project will demonstrate in full scale the operation of a newly constructed 750,000 gpd wastewater treatment facility for the treatment of textile dyeing and finishing wastewaters. The wastewaters originate from the dyeing and finishing of synthetic and blend yarns and exhibit high organic color content. The treatment system includes the following processes: equalization; nutrient and pH control; activated sludge including secondary sedimentation; alum coagulation consisting of rapid mixing, flocullation and final clarification; chlorination; and sludge dewatering. Preliminary plant operating data shows a potential for 95% reduction in BOD and a 90% reduction in color contaminants. The data collected will be sufficient to characterize the raw wastewater, to determine the operating characteristics of the unit processes ( especially with respect to extent of color removal), to fully establish the system treatment capabilities, and to determine the cost of treatment under a variety of conditions.

## PPB 12100

## LUMBER AND WOOD PRODUCTS

Dun and Bradstreet lists 20,672 establishments under Standard Industrial Classification Number 24, "Lumber and Wood Products, Except Furniture." The majority of these plants are operating a separate processing step in the conversion of forest products to useable materials. In this category are found sawmills; veneer plants; plywood mills; hardboard, insulation board, and chipboard mills; and wood preserving industries. While this R&D Program is headquartered in Washington, D.C., program support and in-house research aspects are centered at the Pacific Northwest Water Laboratory in Corvallis, Oregon.

The waste disposal problems generated by the lumber and wood products industry are varied in nature and severity as to effect on receiving waters. Water quality degradation can be measured from the practice of log rafting and transport, through log pond operation, with the leaching of soluble materials, from color, and by bark debris being the principal effects. Simple timber conversion steps, as lumber production at sawmills, create waste which may contribute to water pollution if not controlled,or to air pollution if burned. For most larger sawmill operations, wood residues (as chips and sawdust) are utilized in higher value uses such as pulp, hardboard, chipboard, and insulation board manufacture. The disposal of bark at sawmills and veneer mills is a current problem with growing restraints on the burning of such wastes to prevent air pollution. Plywood mills, wet process hardboard, and insulation board mills contribute water carried wastes containing water soluble wood extractives, urea-formaldehyde and phenolic glue residuals, fire retardants, pesticides, and wood fiber as the product may require. Wood preservation utilizes a number of heavy metals, pentachlorophenol, creosote, and oil in processing lumber, poles and piling. Water carried wastes are derived from these operations.

The R&D program objectives are aimed at assessing the impact of wastes on the environment and the impact of in-plant control, or treatment, of wastes in reducing their pollutional effect. These objectives of waste control will largely be achieved through a tightening of in-plant losses and water re-use as well as specific waste treatment measures tailored for the problem existing. This program should expand in the future as added extramural projects are funded and personnel for in-house research projects become available.

## PROJECT INDEX

## PPB 12100 - LUMBER AND WOOD PRODUCTS

| 12100 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| EBG | Oregon State University | B | 11-6 |
| EZU | Klamath Plywood Corporation | B | 11-7 |
| HIG | Koppers Company, Inc. | C | 11-8 |
| 801202 | Garrett Research & Development Corp. | C | 11-9 |
| 801308 | Mississippi State University | C | 11-10 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

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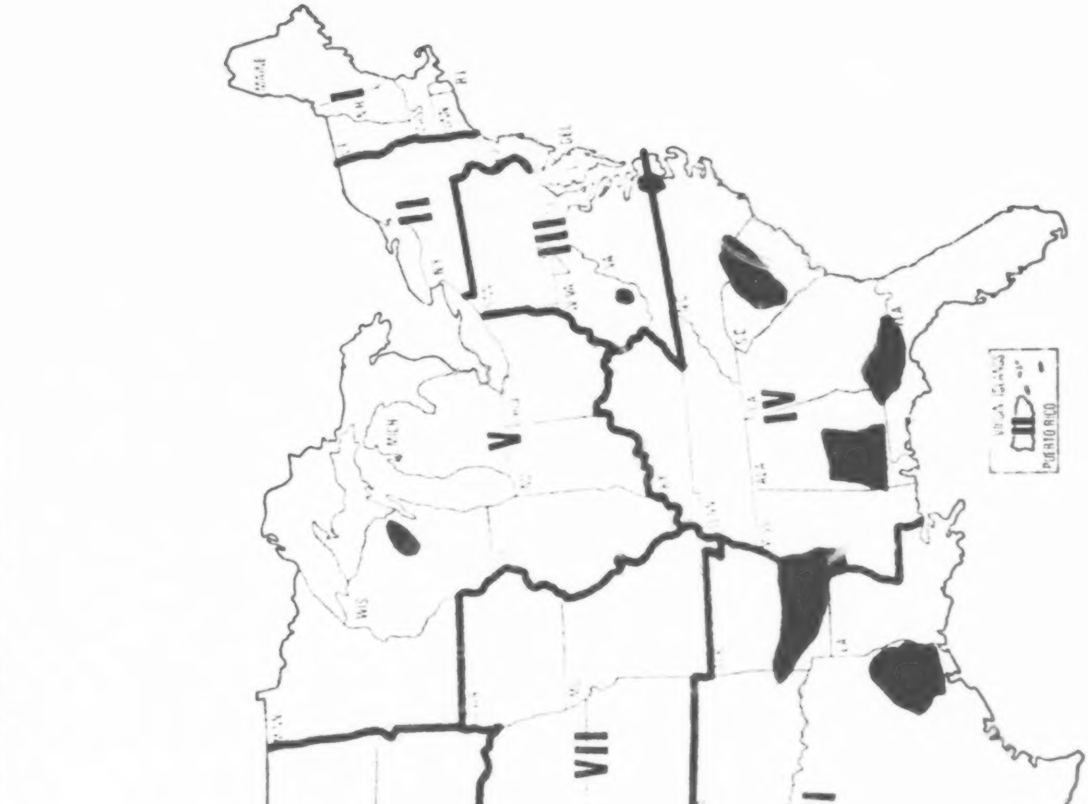
## LOCATION OF MAJOR SAW MILLS AND PLANING MILLS


I
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PUERTO RICO

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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12100 EBG

TITLE OF PROJECT: Influence of Log Rafting on Water Quality

GRANTEE OR CONTRACTOR:
Department of Civil Engineering
Oregon State University
Corvallis, Oregon 97331

EPA PROJECT OFFICER:
H.K. Willard
Pacific Northwest Water Laboratory
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Corvallis, Oregon

DESCRIPTION OF PROJECT

Award Date: June 1, 1970 Project Cost: $21,740

Completion Date: May 31, 1971 Federal Cost: $20,633

Summary:

The project objective is to determine the extent of log raft storage at selected locations in the Pacific Northwest and, using data from previous experiments, evaluate the potential contribution of log raft storage to water pollution in those areas.

Research efforts during the first two grant years have provided laboratory and field data which quantitate the pollution contributed by individual logs, log segments, and small groups of logs in various water storage situations. These data must now be applied to the vast, but undetermined, quantity of logs in water storage in the Pacific Northwest, so that a reliable estimate of the magnitudes of this pollution source can be made. This information is needed by state pollution control authorities so that log handling and storage activities can be responsibly controlled.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12100 EZU

TITLE OF PROJECT: Aerobic Secondary Treatment of Plywood Glue Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Klamath Plywood Corporation<br>P.O. Box 1239<br>Klamath Falls, Oregon 97601 | H.K. Willard<br>Pacific Northwest Water Laboratory<br>200 Southwest 35th Street<br>Corvallis, Oregon 97330 |

Project Site: Klamath Falls, Oregon

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | April 19, 1968 | Project Cost: | $65,040 |
| Completion Date: | January 31, 1972 | Federal Cost: | $42,028 |

Summary:

The project objectives of this grant are to design, construct, operate and evaluate an extended aeration, activated sludge lagoon treatment plant on urea-formaldehyde glue wastes in order to provide data for others to utilize in efforts to abate water pollution.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12100 HIG

TITLE OF PROJECT: Treatment of Wood Preserving Wastewater by Chemical and Biological Methods

GRANTEE OR CONTRACTOR:
Koppers Company, Inc.
P.O. Box 270
Carbondale, Illinois 62901

EPA PROJECT OFFICER:
James Phillips
Region V, EPA
1 North Wacker Drive
Chicago, Illinois 60606

Project Site: Carbondale, Illinois

DESCRIPTION OF PROJECT

Award Date: June 1, 1971

Project Cost: $179,000

Completion Date: June 1, 1973

Federal Cost: $99,500

Summary:

The project consists of the design, construction, and operation of treatment facilities for wood preserving wastewaters. The 25,000-gpd waste flow is characterized by high BOD and COD, moderate concentrations of phenols, and low pH. The proposed treatment system will utilize pre-skimming and sedimentation, pre- and post-chlorination, and activated sludge secondary treatment. The treatment system will be operated for a 12-month period in which performance and cost of treatment will be documentated.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801202

TITLE OF PROJECT: "Pyrolysis of Industrial Waste for Oil and Activated Carbon Recovery"

GRANTEE OR CONTRACTOR:
Garrett Research &
Development Co., Inc.
1855 Carrion Road
La Verne, California 91750

EPA PROJECT OFFICER:
Dr. James D. Gallup
EPA-Xerox Building Rm. 316
Washington, D.C. 20460

Project Site:
La Verne, California

DESCRIPTION OF PROJECT

Award Date:
May 1, 1972

Project Cost: $440,746

Completion Date:
August 31, 1973

Federal Cost: $292,556

Summary:

The objective of this research project is to demonstrate the economic and technical effectiveness of the flash pyrolysis process to dispose of industrial wastes, principally bark, with the production of activated carbon and heating oil as by-products. A modified four ton/day pilot plant will be operated utilizing bark, rice hulls, and cattle feedlot wastes to provide process engineering data for the design of commercial scale demonstration plants.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

## PPB 12110

## RUBBER AND PLASTICS PRODUCTS

The R&D program for the rubber and plastics industry receives support under the EPA grant and contract monies from Section 5 and Section 6 of the Clean Water Restoration Act of 1966. The objectives of the program are to:

1. Define the water pollution problem as it pertains to the rubber and plastics industry.
2. Research, develop, and demonstrate the required technology to achieve at minimum cost the equivalent of best practicable and best available treatment and closed loop systems.

The objectives are met through the awarding of grants and contracts to universities, industries, and municipalities and through in-house research activities carried out by the Grosse Ile Field Station.

The wastewater flows may be identified with the manufacture of basic resins organic chemicals and manufactured rubber products. These include the chemicals and raw materials for manufactured products:

1. Plastic resins - cellulose acetate, cellophane, polyvinyl chloride, polyvinyl alcohol, polystyrene, styrene-acrylonitrile, acrylonitrile-butadiene-styrene, high denisty polyethylene, low density polyethylene, polypropylene, acrylic, alkyd, unsaturated polyester, urea-formaldehyde, melamine-formaldehyde, phenolic, epoxy, polyacetal, urethane, nylon, and polycarbonate.
2. Rubber organic chemicals - styrene and butadiene.

In 1968 the rubber and plastics industry used 1106 billion gallons of water for the manufacturing processes. The fresh water intake was approximately 427 billion gallons, the consumption was 42 billion gallons and the industry had a water reuse factor of 2.6.

## PROJECT INDEX

## PPB 12110 - RUBBER AND PLASTICS PRODUCTS

| 12110 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| DJI | B. F. Goodrich Chemical Co. | A | 12-5 |
| GUT | General Tire & Rubber Company | C | 12-6 |
| GLP | Firestone Tire and Rubber Company | C | 12-7 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**

**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12020 DJI

TITLE OF PROJECT: Waste Treatment Facilities for Polyvinyl Chloride Manufacturing Plant

GRANTEE OR CONTRACTOR:
B. F. Goodrich Chemical Company
3135 Euclid Avenue
Cleveland, Ohio 44115

EPA PROJECT OFFICER:
Gilbert Horowitz
Region III, EPA
Curtis Building
Sixth and Walnut Streets
Philadelphia, Pennsylvania 19106

Project Site: Salem County, New Jersey

DESCRIPTION OF PROJECT

Award Date: July 2, 1968

Project Cost: $823,100

Completion Date: December 1, 1971

Federal Cost: $364,900

Summary:

This project involves the development, demonstration, and evaluation of the bio-chemical treatment of wastewaters from a typical polyvinyl chloride manufacturing plant at a 0.85-mgd scale of operation.

The treatment system is to produce effluent to meet the receiving water standards (Delaware River) of BOD removal of greater than 85 per cent, turbidity of not greater than 30 units above river water, and absence of taste- and odor-producing substances.

The process will consist of chemical pretreatment with primary sedimentation, followed by activated sludge secondary treatment and a final polishing pond. Tertiary treatment studies with activated carbon are also contemplated to determine the extent to which the secondary effluent will lend itself to tertiary treatment, as future Delaware River standards may require the equivalent of tertiary treatment.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12020 GUT

TITLE OF PROJECT: Industrial Wastewater Renovation Plant, The General Tire & Rubber Co., Odessa, Texas

GRANTEE OR CONTRACTOR:
The General Tire & Rubber Co.
Odessa, Texas

EPA PROJECT OFFICER:
George Putnicki
Region VI, EPA
1402 Elm Street
Dallas, Texas 75202

Project Site: Odessa, Texas.

DESCRIPTION OF PROJECT

Award Date: December 30, 1970 Project Cost: $938,680

Completion Date: June 30, 1973 Federal Cost: $461,890

Summary:

The proposed project is to demonstrate the applicability of a vertical tube evaporator (VTE) distillation plant for the renovation of organics containing industrial wastewater.

The chemical waste effluent emanating from the General Tire and Rubber Company Synthetic Rubber Plant, Odessa, Texas, at rates up to 750,000 gpd, contains dissolved solids, mostly sulphates and chlorides in concentrations up to 7,000 ppm in addition to organics in excess of 100 ppm. The proposed VTE plant will be used to obtain high quality water for reuse. The residual concentrated brine will be disposed of by means of the existing 90-acre pvc-lined evaporation ponds.

This grant is intended to demonstrate the applicability of VTE to the renovation of organics containing industrial waste effluents providing high quality recycle water and the substantial reduction of the waste for ultimate disposal to a practical volume. This system will have applicability to a wide spectrum of industrial plant effluents, including those where reduction of effluent to complete dryness is desired.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12110 GLP

TITLE OF PROJECT: Air Flotation - Biological Oxidation of Synthetic Rubber and Latex Wastewater

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Firestone Tire and Rubber Co.<br>Synthetic Rubber and Latex Div.<br>381 W. Wilbeth Road<br>Akron, Ohio 44317 | George Putnicki<br>Region VI, EPA<br>1402 Elm Street<br>Dallas, Texas 75202 |

Project Site: Lake Charles, Louisiana

DESCRIPTION OF PROJECT

Award Date: February 1, 1971 Project Cost: $1,872,501

Completion Date: August 31, 1972 Federal Cost: $392,288

Summary:

The Synthetic Rubber and Latex Division of Firestone will construct and operate, on a full-scale basis, a secondary treatment system for the control of 3.6 mgd of wastewater from a synthetic rubber plant. The rubber plant produces 30 types of butadiene-styrene products and 4 types of stereo specific polymers. The waste treatment system is expected to reduce the BOD by 90 per cent and the suspended solids by 95 per cent. The proposed system consists of pH control, flocculation, air flotation, biological oxidation, and sludge dewatering. The treatment system will be operated and evaluated for its effectiveness of treatment for a 9-month period.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# PPB 12120

# MISCELLANEOUS INDUSTRIAL SOURCES

Industrial wastes which are not clearly identified with any of the foregoing subprogram elements and which are of insufficient number in any one group to justify a separate category are included in this subprogram element.

This designation should in no way be construed as an indicator of low priority or lack of interest, but rather as a convenience for R&D management purposes.

Activities involving the disposal of water treatment plant sludges, as well as on ways of recovering water treatment chemicals, are included in this subprogram. Also, removal of synthetic detergents and reclamation of laundry wastes, as well as water conservation, are activities of concern. In addition, the various tanning process, such as chrome, alum, and vegetable tanning, are among the projects in the miscellaneous industrial category.

Objectives are to:

1. Demonstrate the effectiveness of anaerobic-anerobic lagooning of vegetable tanning wastes.
2. Demonstrate the feasibility of treating three types of leather tannages combined.
3. Demonstrate the suitability of treating mixed chrome tannery wastewater and sanitary sewage.
4. Investigate the suitability of water renovation and reuse in laundering operations.
5. Develop means and procedures for the recovery of water-softening chemicals and the disposal of water treatment plant sludges.

## PROJECT INDEX

## PPB 12120 - MISCELLANEOUS INDUSTRIAL SOURCES

| 12120 | Grantee or Contractor | Project Status* | Page |
|---|---|---|---|
| WPD 185 | University of Cincinnati | A | 13-7 |
| ERC | American Water Works Association Research Foundation | A | 13-8 |
| DOD | Rensselaer Polytechnic Institute | B | 13-9 |
| DIK | University of Virginia | A | 13-10 |
| ESW | Gainesville, Florida | A | 13-11 |
| EUR | American Water Works Association Research Foundation | A | 13-12 |
| EFM | Cardwell Lace Leather Company | B | 13-13 |
| WPRD 133 | A.C. Lawrence Leather Company | A | 13-14 |
| DSG | S.B. Foot Tanning Company | C | 13-15 |
| EPC | Blueside Real Estate, Inc. | C | 13-16 |
| ERF | Berkey Film Processing | B | 13-17 |
| FYF | Ohio Department of Natural Resources | C | 13-18 |
| FYV | IIL/LSAA Technical Liaison Committee | C | 13-19 |
| GLE | Culligan International Company | C | 13-20 |
| HMZ | Montgomery, Alabama | C | 13-21 |
| FRM | Albany, New York | B | 13-22 |
| S800936 | American Water Works Association | C | 13-23 |
| S801037 | Pfister & Vogel Tanning Company | C | 13-24 |
| 801203 | Tanners' Council of America, Inc. | C | 13-25 |

*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

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# FINAL REPORTS AVAILABLE

## PPB 12120 - MISCELLANEOUS INDUSTRIAL SOURCES

| Report Number | Title/Author | Source |
|---|---|---|
| 12120 ERC 08/69 | Disposal of Wastes from Water Treatment Plants, American Water Works Association Research Foundation, New York, New York. | NTIS<br>PB 186 157 |
| 12120 --- 09/69 | Activated Sludge Treatment of Chrome Tannery Wastes, A.C. Lawrence Company, Peabody, Mass. | GPO - $2.00 |
| 12120 --- 09/70 | Treatment of Sole Leather Vegetable Tannery Wastes, Dr. J. David Eye, University of Cincinnati, Ohio. | GPO - $1.25 |
| 12120 DIK 12/70 | Anaerobic-Aerobic Lagoon Treatment for Vegetable Tanning Wastes, University of Virginia, Charlottesville, Virginia. | GPO - $1.00 |
| 12120 ESW 06/71 | Magnesium Carbonate, A Recycled Coagulant for Water Treatment; by Dept. of Public Utilities, City of Gainesville, Florida. | GPO - $1.00 |
| 12120 EUR 11/71 | Information Resource: Water Pollution Control in the Water Utility Industry; by American Water Works Assoc. Research Foundation, New York, New York. | GPO - $1.50 |

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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPD 185-02-68 (PPB 12120)

TITLE OF PROJECT: Treatment of Sole Leather Vegetable Tannery Wastes

GRANTEE OR CONTRACTOR:
Department of Environmental Health Engineering
University of Cincinnati
Cincinnati, Ohio

EPA PROJECT OFFICER:
George Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Marlinton, West Virginia

DESCRIPTION OF PROJECT

Award Date: May 1, 1968 Project Cost: $70,825 (2nd year)

Completion Date: September 1, 1970 Federal Cost: $29,325 (2nd year)

Summary:

Four major studies, two pilot-scale and two full-scale, were carried out during the period of this investigation. The basic objective of the studies was to find a technically feasible and economical procedure for treating the wastes from a sole leather vegetable tannery. A detailed identification of the sources of all wastes as well as a comprehensive characterization of each waste fraction was made for the International Shoe Company Tannery located at Marlinton, West Virginia.

It was found that a large percentage of the pollutants initially were contained in a relatively small fraction of the total waste volume. The treatment scheme consisted of separation and pretreatment of the individual waste streams followed by mixing all waste streams for additional treatment in an anaerobic-aerobic lagoon system.

The lime bearing wastes from the beamhouse were screened, treated with polyelectrolytes, and then clarified. The lime sludge was used for landfill. The system was designed to treat one million gallons of waste per week. BOD was reduced 85-95 per cent and the suspended cost of the total system was approximately $40,000 and it is estimated that the operating cost will be about $15,000 per year or 7 cents per hide processed.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 ERC

TITLE OF PROJECT: Disposal of Wastes from Water Treatment Plants

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| American Water Works Association<br>Research Foundation<br>2 Park Avenue<br>New York, New York 10016 | George Webster<br>Industrial Pollution Control Branch<br>Water Quality Research, EPA<br>Washington, D.C. 20242 |

Project Site: New York, New York

DESCRIPTION OF PROJECT

Award Date: July 25, 1968    Project Cost: $53,250

Completion Date: July 25, 1969    Federal Cost: $46,305

Summary:

The final report to this project presents an intensive study of the disposal of wastes from water treatment plants. The wastes include filter washwater; sludge resulting from coagulation, softening, iron and manganese removal processes; diatomaceous earth filtration; and ion exchange brines. The control of pollution from these wastes is a high priority problem for the water utility industry.

A series of four status reports describe in detail what is known of the research, engineering, plant operation, and regulatory aspects of the problem. A special report reviews current technology and analyzes costs of disposal methods, based on data collected from 15 operating plants. A conference was organized to provide expert evaluation of each report and to extend the data available.

Final reports were prepared by committees of conference participants to identify future needs for information in each aspect of the waste disposal problem. These reports recommend substantially expanded programs of research and demonstration. They include extensive lists of specific problems which must be investigated to develop effective and economical technology. Committee reports also recommend establishment of a central service to promote the planning of research and development, and to implement effective programs of new or improved technology. The service would collect, coordinate, and disseminate data on all aspects of water treatment plant waste disposal problems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 DOD

TITLE OF PROJECT: Removal of Syndets and Reclamation of Laundry Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Rensselaer Polytechnic Institute<br>Research Division<br>Troy, New York 12181 | Richard Keppler<br>Region I, EPA<br>John F. Kennedy Federal Building<br>Boston, Massachusetts 02203 |

Project Site: Troy, New York

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | December 1, 1968 | Project Cost: | $53,090 |
| Completion Date: | November 1, 1971 | Federal Cost: | $25,055 |

Summary:

The objective of this project is to optimize and evaluate the best process or combination of processes attainable for the treatment and recovery of laundromat wastewaters. Two commercially available treatment systems for laundromat wastewaters are to be used in the optimization and evaluation project. The needs required to produce waste effluents suitable for discharge to New York State receiving waters and the treatment requirements to produce reusable water for laundromats will be determined and demonstrated.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 DIK

TITLE OF PROJECT: Anaerobic - Aerobic Lagoon Treatment for Vegetable Tanning Wastes

GRANTEE OR CONTRACTOR:
University of Virginia
Department of Civil Engineering
Charlottesville, Virginia 22903

EPA PROJECT OFFICER:
George Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: Luray, Virginia

DESCRIPTION OF PROJECT

Award Date: January 18, 1969 Project Cost: $68,500

Completion Date: May 31, 1970 Federal Cost: $17,801

Summary:

A field demonstration lagoon was operated at Virginia Oak Tannery, Inc., Luray, Virginia to evaluate the effectiveness of an anaerobic-aerobic lagoon in treating spent vegetable tannins blended with batepool and soak wastewaters. The anaerobic-aerobic lagoon system was used to treat combined waste streams with a $BOD_5$ concentration of approximately 1000 mg/ . Aeration and volume of the lagoon were fixed and flow to the system was varied. The system load varied by increasing the flow so as to observe five operational phases. Operational phases were designed to cause the system to go from aerobic conditions to anaerobic-aerobic. After reaching anaerobic-aerobic conditions, doubling the $BOD_5$ load did not result in a significant decrease in $BOD_5$ removal efficiency.

Although the lagoon system proved successful in removing degradable organics, color of the wastewater was not reduced by this method of treatment. Color of spent vegetable tannins is a major problem and will dictate the most desirable approach to treating this wastewater.

A completely mixed aeration unit was used in the laboratory to study the biological degradation of spent vegetable tannins. Concentrated and diluted tannins were studied by varying the detention time in the aeration unit. It was found that approximately 60 per cent of the COD of spent vegetable tannins is not biological degradable and the generally accepted substrate-growth interaction relationship required modification to take into account the non-degradable fraction of COD. Yield coefficients, endogenous respiration rate, and specific growth were computed from the results of the laboratory study.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 ESW

TITLE OF PROJECT: Magnesium Carbonate, a Recycled Coagulant for Water Treatment

GRANTEE OR CONTRACTOR:
City of Gainesville, Florida

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Gainesville, Florida

DESCRIPTION OF PROJECT

Award Date: November 12, 1969 Project Cost: $27,554

Completion Date: June 11, 1971 Federal Cost: $16,890

Summary:

The principal investigator has a modified process for the recovery of MgO from brucite or dolomite to the separation and essentially quantitative recovery of the Mg $(OH)_2$ present in lime-soda softening sludges as very pure (99.7 per cent) $MgCO_3$. This new process has been successfully tested on a pilot-plant scale at Dayton, Ohio, for the past year and plans are now being made for the full-scale recovery of $MgCO_3$ from the sludge produced by both of Dayton's softening plants.

Another improvement of the process makes it possible for each of the several cities and industrial plants softening hard surface waters containing clay turbidity to employ both lime recalcination and magnesium recovery. This will substantially reduce treatment costs and also substantially eliminate a major water pollution problem. Applications of $MgCO_3$ as a coagulant to be studied include the following:

1. Use in the removal of turbidity and organic color from soft surface waters.
2. Use in the removal of turbidity and organic color from hard or alkaline surface or well waters.
3. Use in flocculation or sewage and for many types of industrial wastes.
4. Use with synthetic organic anionic and cationic polymers in the three applications listed above.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Research, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 EUR

TITLE OF PROJECT: Information Resource for Water Pollution Control in the Water Utility Industry

GRANTEE OR CONTRACTOR:
American Water Works Association
Research Foundation
2 Park Avenue
New York, New York 10016

EPA PROJECT OFFICER:
George Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: New York, New York

DESCRIPTION OF PROJECT

Award Date: June 28, 1970

Project Cost: $42,720

Completion Date: December 31, 1971

Federal Cost: $24,990

Summary:

The objective of this project is to establish a research and development oriented information resource for the water utility industry. The information center will provide efficient collection, synthesis, and dissemination of information pertaining to the development and demonstration of water pollution control technology within the water utility industry.

The available literature concerning the water pollution control technology of the water industry will be abstracted and indexed for the Water Resources Scientific Information Center.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b) *,
Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 EFM

TITLE OF PROJECT: Complete Treatment of Tannery Industrial Waste for Chrome Tanning, Alum Tanning, and Vegetable Tanning

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Caldwell Lace Leather Company<br>Auburn, Kentucky 42206 | James Westrick<br>National Environmental Research Center, EPA<br>Cincinnati, Ohio 45268 |

Project Site: Auburn, Kentucky

DESCRIPTION OF PROJECT

Award Date: December 23, 1966 Project Cost: $68,200

Completion Date: March 1, 1972 Federal Cost: $46,340

Summary:

No completely satisfactory method has been devised for treating tannery industrial waste. Since tanneries use large volumes of water, containing organic and inorganic matter, suitable treatment methods must be found.

The objectives of the project are to demonstrate the feasibility of completely treating tannery waste from the only plant in the United States that tans all three types of leather tannages (chrome, vegetable, and alum) and to obtain basic data to design full-scale treatment plants usable for any tannery.

The basic plan is to develop methods to pretreat the three present leather tannages, to combine their streams, and to completely treat tannery industrial waste. The high alkaline content of beam house waste will be neutralized with high acid made up of various tannages. The organic solids will be reduced in an anaerobic-aerobic lagoon.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *.*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: WPRD 133-01-68 (PPB 12120)

TITLE OF PROJECT: Activated Sludge Treatment of Chrome Tannery Wastes

GRANTEE OR CONTRACTOR:
A.C. Lawrence Leather Company
Division of Swift & Company
10-18 Sawyer Street
Peabody, Massachusetts

EPA PROJECT OFFICER:
George Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: South Paris, Maine

DESCRIPTION OF PROJECT

Award Date: August 30, 1967 Project Cost: $124,593

Completion Date: September 30, 1971 Federal Cost: $87,215

Summary:

The A.C. Lawrence Leather Company tannery at South Paris, Maine is a chrome side upper leather tannery. The water use at the tannery is about 1.0 mgd. Each day the waste discharged from the tannery contains about 8,500 lbs of 5-day, 20° BOD, 70,000 lbs of total solids, of which about 17,000 lbs are suspended and 53,000 lbs are dissolved. The pH of the wastewater varies from 5.0 to 12.0. The daily waste discharge also contains about 8,000 lbs of calcium, as $CaCO_3$, 300 lbs of sulfides, and 1,800 lbs of chromium.

A waste treatment process was developed and tested, in pilot-plant scale, for the treatment of the tannery wastes in combination with municipal sewage. The process consisted of the following steps in the order employed; equalizing and mixing of the alkaline and acid wastes; primary sedimentation; carbonation followed by upflow sedimentation; addition of screened municipal sewage; activated sludge treatment and secondary sedimentation of the mixed wastes; and chlorination. The sludges resulting from the treatment of the wastes and sewage were dewatered by centrifuge and were found to be suitable for burial. Design factors for the various steps of the process were developed and are presented in the attached report. Studies were made of the fundamental systems and reactions which form the basis for the processes employed in the pilot plant.

The results of the pilot-plant investigation indicate that by use of the methods recommended, which are basically conventional sewage treatment unit processes, mixtures of chrome tannery wastes and municipal sewage can be treated successfully.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 DSG

TITLE OF PROJECT: Aerobic Biological Treatment, Sludge Dewatering, and Disposal and Effluent Reuse for a Side Leather Tannery

GRANTEE OR CONTRACTOR:
S.B. Foot Tanning Company
Red Wing, Minnesota

EPA PROJECT OFFICER:
Clarence C. Oster
Minnesota - Wisconsin Field Office, EPA
7401 Lyndale Avenue South
Minneapolis, Minnesota 55423

Project Site: Red Wing, Minnesota

DESCRIPTION OF PROJECT

Award Date: May 15, 1968

Project Cost: $2,046,268

Completion Date: May 15, 1972

Federal Cost: $475,000

Summary:

This project will provide a full-scale demonstration and investigation of primary sedimentation, biological secondary treatment utilizing aerated lagoons, and primary and secondary sludge dewatering and disposal by means of pressure filtration and incineration. The system will treat the total waste flow of 2.1 mgd from the side leather tannery. In addition, an evaluation will be conducted to determine the influence of final treatment plant effluent reuse on hide processing and quality of the finished product by reusing it in the "limepaddle" and "wash soak" tanning operations.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 EPC

TITLE OF PROJECT: Removal and Recovery of Sulfide from Tannery Wastes

GRANTEE OR CONTRACTOR:
Blueside Real Estate, Inc.
800 N. Atlantic Ave.
Kansas City, Missouri 64116

EPA PROJECT OFFICER:
William Banks
Region VII, EPA
911 Walnut Street
Kansas City, Missouri 64106

Project Site: St. Joseph, Missouri

DESCRIPTION OF PROJECT

Award Date: April 13, 1970 Project Cost: $388,900

Completion Date: April 13, 1972 Federal Cost: $110,950

Summary:

The basic objectives of the project are to translate pilot-plant results into the development and demonstration on a plant scale of a process for removing sulfide from the effluent of a chrome tannery and recovering the sulfide in a form reuseable in the tannery. The project will demonstrate the technical feasibility of the sulfide removal method and will determine the economics of the process on a full-scale plant.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 ERF

TITLE OF PROJECT: Treatment of Complex Cyanide Compounds for Reuse and Disposal

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Berkey Film Processing<br>260 Lunenburg Street<br>Fitchburg, Massachusetts 01420 | Thomas Devine<br>New England Basins Office, EPA<br>240 Highland Avenue<br>Needlam Heights, Massachusetts 02194 |

Project Site: Rochester, New York

DESCRIPTION OF PROJECT

Award Date: April 23, 1970 Project Cost: $163,576

Completion Date: April 23, 1971 Federal Cost: $114,415

Summary:

The basic objective in this project is to research and develop methods for the treatment of ferrocyanide waters from film processing for recovery and disposal. Recovery methods to be explored are ozonation and electrolytic oxidation to ferricyanide. Treatment for disposal includes ozonation for destruction, precipitation of complex cyanides, and chlorination.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 FYF

TITLE OF PROJECT: Fluidized-Bed Incineration of Selected Carbonaceous Industrial Wastes

GRANTEE OR CONTRACTOR:
Ohio Department of Natural Resources
Ohio Departments Building
Columbus, Ohio 43215

EPA PROJECT OFFICER:
Eugene Harris
National Environmental Research Center, EPA
Cincinnati, Ohio 45268

Project Site: Columbus, Ohio

DESCRIPTION OF PROJECT

Award Date: June 25, 1970 Project Cost: $140,818

Completion Date: September 30, 1971 Federal Cost: $98,573

Summary:

The Ohio Department of Natural Resources, with the assistance of the Battelle Memorial Institute of Columbus, Ohio, will undertake a project with the following objectives:

1. Evaluation of the characteristics of aqueous wastes from selected industries, including the paint, textile, rubber, and plastics industries, to determine their amenability to fluidized-bed incineration.
2. Determination of the conditions required for burning the selected wastes so that the carbonaceous constituents will be eliminated without the production of noxious gases or other air pollution problems.
3. Assessment of the overall technical and economic feasibility of fluidized-bed incineration for each waste under consideration.

The application and use of the fluidized-bed process to water pollution control provides an effective means of treating certain types of industrial wastes with the elimination of the discharge of pollutants into streams and sewers.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section 6 (b), Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 FYV

TITLE OF PROJECT: Modular Laundry Wastewater Treatment System for the Textile Maintenance Industry

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| IIL/LSAA Technical Liaison Committee<br>P.O. Box 2427<br>Miami Beach, Florida 33140 | Arthur H. Mallon, P.E.<br>Applied Science & Technology Branch<br>Office of Research & Monitoring, EPA<br>Washington, D.C. 20460 |

Project Site: The Roscoe Company
3517 W. Harrison, Chicago, Illinois 60624

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | February 1, 1971 | Project Cost: | $185,277 |
| Completion Date: | August 1, 1972 | Federal Cost: | $122,613 |

Summary:

The purpose of this project is to demonstrate the technical and economic feasibility of a modular treatment system applied to an industrial laundry.

Specific objectives are:

1. Design, building, operation, and evaluation of a modular laundry wastewater treatment system incorporating chemical flotation, dissolved air flotation, diatomaceous earth filtration, and vacuum filtration.
2. Conduction of a survey of selected textile maintenance plants to determine if, where, and how it may be possible to reduce the pollutional load of laundry operation by modifying operating practices.
3. Evaluation of how repeated reuse of renovated water affects the laundering process.
4. Development of detailed cost and performance information for the modular treatment system.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12120 GLE

TITLE OF PROJECT: Industrial Water Softener Waste Brine Reclamation

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Culligan International Co.<br>One Culligan Parkway<br>Northbrook, Illinois 60062 | Vern Tenney<br>Region IX, EPA<br>760 Market Street<br>San Francisco, California 94102 |

Project Site: Riverside, California

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | April 15, 1971 | Project Cost: | $121,212 |
| Completion Date: | July 15, 1972 | Federal Cost: | $69,797 |

Summary:

The project will demonstrate the reuse of regenerant brines from the ion exchange water softening process and determine the economic implication of this process. Involved is the determination of optimum performance characteristics in a study, under actual use conditions, of a central regeneration agency for service exchange water softeners.

Considered will be dosage of chemicals and their effect on quantity and quality of brine recovered.

Detailed performance characteristics of the system, which will optimize the lime-soda hardness reduction process, and chemical analysis of the brines and sludges are sought.

Final report will include data interpretation and economic significance of the process.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (b), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 HMZ

TITLE OF PROJECT: $MgCO_3$ Coagulation in Treatment of Potable Water

GRANTEE OR CONTRACTOR:
Water Works & Sanitary Sewer Board
City of Montgomery
P.O. Box 1631
Montgomery, Alabama 36102
Project Site: Montgomery, Alabama

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

DESCRIPTION OF PROJECT

Award Date: June 1, 1971
Project Cost: $214,520

Completion Date: May 31, 1973
Federal Cost: $99,500

Summary:

The City of Montgomery under the direction of the consultant will operate a pilot-scale facility to demonstrate the use of $MgCO_3$ as a coagulant for the treatment of municipal water. The pilot system (50 gpm) will be operated to verify the scale-up and operating parameters for a subsequent 10-mgd demonstration and evaluation of the $MgCO_3$ system.

The concept of using $MgCO_3$ as a coagulant stems from the search for a solution to the ever increasing problem of disposing of the alum sludges from municipal water treatment. The concept to be piloted and demonstrated will use $MgCO_3$ as the flocculant with MgOH precipitated with the addition of lime. A scheme for recycling the magnesium by carbonation with $CO_2$ will produce a sludge which is easily dewatered and at the same time recover at least 90 per cent of the magnesium for reuse. The project activities will make operational, technical, and cost comparisons between the $MgCO_3$ and conventional alum coagulation systems.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12120 FRM

TITLE OF PROJECT: Treatment of Waste Alum Sludge

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| City of Albany, New York | Dr. J.B. Farrell |
| Department of Water and Water Supply | National Environmental Research Center, EPA |
| City Hall, Albany, New York 12207 | Cincinnati, Onio 45268 |

Project Site: Feura Bush, New York

DESCRIPTION OF PROJECT

Award Date: June 27, 1971 Project Cost: $45,430 (Phase I Only)

Completion Date: August 11, 1972 Federal Cost: $31,871

Summary:

The purpose is to conduct a detailed pilot-plant alum sludge filtration study at the Feura Bush Water Treatment Plant of the City of Albany.

The objectives being to optimize operating parameters, demonstrate process reproducibility, and develop information necessary for full-scale plant design.

Rotary vacuum precoat filtration of alum sludge will be conducted, and technical and economic feasibility will be determined.

A comparison of the performance of various filter aid grades and other operating variables and cost effectiveness of the sludge treatment will be made. Design criteria for a full-scale facility will be sought.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Research *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S 800936

TITLE OF PROJECT: "Information Resource for Water Pollution Control in the Water Utility Industry"

GRANTEE OR CONTRACTOR:
American Water Works Asso.
Research Foundation
2 Park Avenue
New York, New York 10016

EPA PROJECT OFFICER:
George Webster
Industrial Pollution Control Branch
Water Quality Research, EPA
Washington, D.C. 20242

Project Site: New YOrk, New YOrk

DESCRIPTION OF PROJECT

Award Date: Feb. 1, 1972 Project Cost:$46,953

Completion Date: Jan. 31, 1973 Federal Cost: 26,147

Summary:

The objective of this project is to establish a research and development oriented information resource for the water utility industry. The information center will provide efficient collection, synthesis, and dissemination of information pertaining to the development and emonstration of water pollution control technology within the water utility industry.

The available literature concerning the water pollution control technology of the water industry will be abstracted and indexed for the Water Resources Scientific Information Center.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6(b) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: S 801037

TITLE OF PROJECT: "Leather Tannery Waste Management Through Process Change, Reuse and Pretreatment"

GRANTEE OR CONTRACTOR:
Pfister & Vogel Tanning Co., Inc.
1531 No. Water Street, P.O. Box 745
Milwaukee, Wisconsin 53201

EPA PROJECT OFFICER:
William Banks
EPA Region VII
1735 Baltimore, Room 249
Kansas City, Missouri 64106

Project Site: Milwaukee, Wisconsin

DESCRIPTION OF PROJECT

Award Date: March 1, 1972
Project Cost: $275, 905

Completion Date: Feb. 28, 1974
Federal Cost: 99,842

Summary:

This project will demonstrate that it is technically and economically feasible to achieve major reductions in the pollution load discharge from a large side leather tannery through process changes, reuse and recovery techniques and pretreatment methods. Conventional batch type tanning operations will be replaced by newly developed hide processing machines in which the hide is not removed from the unit until the tanning step has been completed. This process change will permit a waste volume reduction of approximately 50 percent. Additional major waste reductions will result from the recovery of processing chemicals and the reuse and pretreatment of individual waste streams. Recovery of soluble proteins extracted from the hides will be investigated. Adequate sampling will be performed to achieve parameter wieght balances throughout multiple process cycles to characterize the tannery effluent.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

PPB 12130

# JOINT INDUSTRIAL/MUNICIPAL WASTES

Joint industrial-municipal wastes are those wastes, treatable at a municipal waste treatment plant, which contain an appreciable amount of waste originating from industrial sources. Projects included in this subprogram activity are those in which the industrial load is more than the municipal domestic load.

Among the broad objectives of this subprogram are the demonstration of the suitability for joint treatment of various categories of industrial wastes, the permissible proportions of a particular industrial waste to domestic waste, the ability of various joint systems to satisfy municipal plant effluent standards, and the capability of joint treatment systems to renovate wastewaters for reuse.

Industries involved in the processing of minerals, carbohydrates, hydrocarbons, refractory materials, and protein materials are of most concern. The wastes are voluminous and greatly varied. They may originate in any of the industries represented by any of the wastewater treatment research subprogram elements. Their volume and composition are best described in the write-ups of the respective industrial pollution control technology subprogram elements.

Use of municipal facilities is preferred by a majority of the smaller industries and accounts for the largest number of establishments whose wastes are treated. From a volume standpoint about two-thirds of industrial wastes are currently treated in industrial waste treatment facilities and one-third are treated in municipal facilities.

Although only 7.5 per cent of the wastewaters of major industrial establishments are being disposed of to municipal sewers, sewering provided the principal waste disposal method for seven of the 11 industrial sectors. The seven industries include food processing, textiles, rubber and plastics, machinery, electrical machinery, transportation equipment, and miscellaneous manufacturing. The wastes of these seven industries are more amendable to treatment at municipal treatment plants than the wastes of the four other industries: paper and allied products, chemicals, petroleum and coal, and primary metals.

In connection with the trend toward increased use of municipal facilities by many industries, it is important to note the rapid increase in municipal treatment capabilities. Both the number of treatment plants and the average level of treatment have risen steadily, the growth being most marked since the institution of federal grants for construction of waste treatment plants. As recently as 1960, almost 30 per cent of the nation's sewered communities did not have waste treatment provided to them. By 1962 less than 20 per cent of the total number of sewered communities were without waste treatment. In 1970 less than 10 per cent were without some degree of waste treatment. Moreover, well over two-thirds of the sewered communities now have secondary waste treatment facilities. Thus, municipal facilities have an increasing potential capacity for handling many industrial wastes.

Joint systems for treating both municipal and industrial wastes in many cases are likely to provide the means of attaining adequate water pollution control most effectively and least expensively. The extent to which joint handling systems will increase over the next five years depends largely upon the managerial ability of municipal and industrial officials and their willingness to enter into such cooperative arrangements. This, in turn, will depend upon the costs which industrial establishments are required to pay to use municipally-operated facilities. To the extent that appropriate charges and pretreatment requirements are fixed and that joint treatment facilities are designed and operated effectively, increased use of such facilities by industry may well lower overall pollution control costs significantly over the next five years.

Reduction of many industrial wastes is often accomplished most efficiently and economically by process modifications. While the rate and effects of technological change are difficult to evaluate, quantities of water used per unit of production have been decreasing in most industries while recycling to make more efficient use of water is increasing. Moreover, modern operational practices and engineering design increasingly stress waste control.

Industrial waste treatment costs are affected significantly by the methods industry employs to reduce its wastes. In general, waste reduction may be accomplished through treatment by municipal facilities, by on-site treatment, through process changes which lessen the amount or strength of wastes generated, by ground disposal, or by combinations of these alternatives.

There are potentially great savings through the "economy of scale" when the treatment facilities are designed to serve joint municipal-industrial needs. Through the described program this area will be thoroughly researched. Included also is the possibility of encouraging industries to utilize the municipal waste handling systems on a special fee basis.

# PROJECT INDEX

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*Project Status:
A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated

## FINAL REPORTS AVAILABLE

## PPB 12130 - JOINT INDUSTRIAL/MUNICIPAL WASTES

| Report Number | Title/Author | Source |
|---|---|---|
| 11060 EOC 07/69 | Joint Municipal and Semichemical Pulping Wastes, City of Erie, Pennsylvania and Hammermill Paper Company. | GPO - $1.50 |
| 11060 FAE 11/69 | Feasibility of Joint Treatment in a Lake Watershed, Onondaga County, New York. | NTIS<br>PB 201 698 |
| 11060 FAE 04/71 | Onondaga Lake Study, Onondaga County, Syracuse, New York. | GPO - $4.50 |
| 11060 DPD 02/71 | Combined Treatment of Municipal Kraft Linerboard and Fiberboard Manufacturing Wastes; by Board of Water Commissioners, City of Macon, Georgia, Georgia Kraft Co., and Armstrong Cork Co. | GPO - $1.25 |
| 12130 EDX 07/70 | Joint Treatment of Municipal Sewage and Pulp Mill Effluents, the Green Bay Metro Sewage District, Green Bay, Wisconsin. | GPO - $6.00 |
| 12130 EZR 05/71 | Combined Treatment of Domestic and Industrial Wastes by Activated Sludge, City of Dallas, Oregon. | GPO - $1.25 |
| 12130 EGK 06/71 | Biological Treatment of Chlorophenolic Wastes, City of Jacksonville, Arkansas. | GPO - $1.50 |
| 12130 FJQ 06/71 | Pollution Abatement and By-Product Recovery in Shellfish and Fisheries Processing, Food Chemical and Research Labs., Inc., Seattle, Washington, and Engineering Science of Alaska, Anchorage, Alaska. | GPO - $1.00 |
| 12130 DUJ 09/71 | Whey Effluent Packed Tower Trickling Filtration; by Quirk, Lawler & Matusky Engineers, Tappan, New York. | GPO - $1.50 |

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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 EDX

TITLE OF PROJECT: Joint Treatment of Municipal Sewage and Pulp Mill Effluents

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Green Bay Metropolitan Sewerage District<br>Green Bay, Wisconsin | George R. Webster<br>Industrial Pollution Control Branch<br>Water Quality Research, EPA<br>Washington, D.C. 20242 |

Project Site: Green Bay, Wisconsin

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | December 1, 1966 | Project Cost: | $335,000 |
| Completion Date: | September 30, 1971 | Federal Cost: | $251,250 |

Summary:

This research project determined the technical and economic feasibility of jointly treating the influent to the present treatment facilities of the Green Bay Metropolitan Sewerage District in combination with the weak effluents from the pulping sections of four local paper mills, specifically American Can Company, Charmin Paper Products Company, Fort Howard Paper Company, and Green Bay Packaging, Inc.

Four activated sludge processes (conventional, step aeration, contact stabilization, and Kraus) were studied in parallel using 1-gpm pilot plants. At the end of the 12 months, the conventional and step aeration processes were eliminated from further consideration. The contact stabilization and Kraus processes were studied for an additional four and one-half months. Contact stabilization was selected as the most promising process and units were operated for an additional five months to obtain refined design and operating parameters for a full-scale treatment plant.

Shortly after initial start-up, the pilot plants became infested with filamentous organisms identified as a bacterial species of the genus Thiothrix, a sulfur-storing organism. Of various procedures implemented, chlorination of the return activated sludge successfully controlled the growth of filamentous organisms which caused sludge bulking. It was also necessary to add nutrients to achieve the desired BOD:N:P ratios. Extensive solids-handling unit process studies were conducted at the pilot-plant site and in the cooperating manufacturer's laboratories.

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# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 EKK

TITLE OF PROJECT: Efficiency and Economy of Polymeric Sewage Clarification

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| City of South St. Paul, Minnesota | Clarence C. Oster<br>Minnesota - Wisconsin Field Office, EPA<br>7401 Lyndale Avenue South<br>Minneapolis, Minnesota 55423 |

Project Site: South St. Paul, Minnesota

DESCRIPTION OF PROJECT

Award Date: June 15, 1967 Project Cost: $845,159

Completion Date: January 31, 1971 Federal Cost: $450,000

Summary:

This demonstration project includes:

1. Construction of new grit chambers (four units: two for industrial wastes, one for sanitary sewage, and one for either industrial or sanitary wastes), which will allow sewage to be treated individually or in combination of the two basic sewages in the treatment process following grit removal.
2. Construction of mechanical flash mix-facilities, laboratory and utility building improvements, and the necessary piping and other appurtenant construction.

The City of South St. Paul will also construct an interceptor sewer, sludge ejector, and pumping station in conjunction with the demonstration project which are not part of this demonstration grant request. The project objectives are to determine the increased purification attainable by treating industrial wastes (packing house), sanitary sewage, combined sanitary sewage, and stormwaters or combinations of such wastes with polyelectrolytes and floc "weighting agents."

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (a)(2) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 FAE

TITLE OF PROJECT: A Demonstration of Joint Municipal-Industrial Waste Treatment in the Onondaga Lake Watershed

GRANTEE OR CONTRACTOR:
Department of Public Works
Onondaga County, New York

EPA PROJECT OFFICER:
Robert Flint
Rochester Field Office, EPA
P.O. Box 4748
Rochester, New York 14612

Project Site: Onondaga County, New York

DESCRIPTION OF PROJECT

Award Date: September 21, 1967 Project Cost: $507,700

Completion Date: September 21, 1970 Federal Cost: $357,150

Summary:

Onondaga Lake has been a receptor of domestic and industrial wastes to such an extent that it is now in an advanced stage of eutrophication. This project is part of a $20 million program to restore Onondaga Lake.

The objectives of this project are:

1. Demonstration of county-industry cooperative wastewater management of municipal-industrial wastes based on an entire watershed.
2. Illustration of the feasibility of treatment of mixtures of industrial and domestic wastes.
3. Demonstration of the treatment of an industrial waste stream with the waste effluent from another industry.
4. Evaluation of the effects of proposed management and treatment methods on the economics of the treatment processes and on the restoration of the lake.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 EZR

TITLE OF PROJECT: Combined Treatment of Domestic and Industrial Wastes by Activated Sludge

GRANTEE OR CONTRACTOR:
City of Dallas, Oregon

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Dallas, Oregon

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: December 12, 1967 | Project Cost: $463,472 |
| Completion Date: May 1, 1971 | Federal Cost: $325,104 |

Summary:

The operation of a completely aerobic secondary treatment facility for treatment of combined domestic and industrial wastewater from the City of Dallas, Oregon, was studied for a period of 15 months. The system was designed for an average daily flow of 2.0 mgd and a BOD load of 7000 pounds per day. The results of this study indicate the flexibility and economy of the completely aerobic system, consisting of activated sludge with aerobic digestion, for a small community with proportionately high industrial wastewater loads. The effluent BOD concentration averaged 8 mg/l and the effluent total suspended solids concentration averaged 13 mg/l for the 15-month study period. The biological solids yield averaged about 0.7 pounds of solids per pound of BOD removed and the net accumulation of biological volatile solids was about 0.42 pounds of volatile solids per pound of BOD removed. These values were obtained with a MLSS concentration range of 700 to 3000 mg/l, an average sludge age of 19 days and an organic loading range of 0.05 to 0.40 pounds of BOD per pound of MLSS per day. Total capital cost of the system was about 66 per cent of that for a conventional activated sludge plant and operation and maintenance costs were only about 33 per cent of those for a conventional system.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (a)(2) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 EJD

TITLE OF PROJECT: A Pretreatment Study on Combined Industrial-Municipal Wastewaters

GRANTEE OR CONTRACTOR:
City of Hagerstown, Maryland

EPA PROJECT OFFICER:
Harold Snyder
Oil and Hazardous Materials Program
Water Quality Research, EPA
Washington, D.C.

Project Site: Hagerstown Sewage Treatment Plant
Hagerstown, Maryland

DESCRIPTION OF PROJECT

Award Date: March 15, 1968 Project Cost: $427,853

Completion Date: July 1, 1971 Federal Cost: $320,890

Summary:

This project is to evaluate pretreatment techniques for textile dyeing wastes. The dye wastes are reduced sulfur compounds with a high immediate and ultimate oxygen demand that cannot be satisfied in an activated sludge system. The pretreatment technique is to provide initial oxidation by diffused aeration, chlorination, and the separate additions of sodium nitrate and potassium permanganate. Ammoniation will also be used. The project will be for two years and include a waste source investigation, detailed baseline analyses, construction of the pretreatment facilities and full-scale paralleling of the treatment system, and evaluation of the pretreatment techniques.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 DLF

TITLE OF PROJECT: Tertiary Treatment of Combined Domestic/Industrial Wastes

GRANTEE OR CONTRACTOR:
City of Tualatin, Oregon

EPA PROJECT OFFICER:
Dennis Taylor
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Tualatin, Oregon

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | March 20, 1968 | Project Cost: | $323,600 |
| Completion Date: | August 1, 1971 | Federal Cost: | $230,800 |

Summary:

A secondary and tertiary sewage treatment plant will be constructed for treatment of combined municipal and industrial wastes. The industrial waste is generated by the manufacture of dog food and will comprise 25 per cent of the BOD load on the treatment plant. The plant will be operated and studied for a period of one year. The tertiary plant (consisting of flocculation, settling, and filtration) will be operated with the addition of slum for phosphate removal during the critical six months of low stream flow. During the remainder of the year, the secondary effluent will receive plain filtration to maintain a very high quality effluent. The feasibility of alternate methods of chemical sludge disposal and the economics of tertiary treatment with phosphate removal will be studied.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 EOC

TITLE OF PROJECT: Joint Municipal and Semichemical Pulping Wastes

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>City of Erie<br>Erie, Pennsylvania | EPA PROJECT OFFICER:<br>George R. Webster<br>Industrial Pollution Control Branch<br>Water Quality Research, EPA<br>Washington, D.C. 20242 |

Project Site: Erie, Pennsylvania

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | June 20, 1968 | Project Cost: | $333,674 |
| Completion Date: | July 31, 1969 | Federal Cost: | $88,230 |

Summary:

The City of Erie, Pennsylvania and Hammermill Paper Company made a study of the joint treatment of domestic sewage and pulp and papermaking wastes. A pilot plant was constructed and operated in a series of controlled experiments. Supplemental studies were conducted in the Hammermill laboratories including the operation of a bench-scale activated sludge plant.

It was demonstrated that a joint treatment plant could effectively treat a mixture of domestic sewage and pulp and paper mill wastes from Hammermill's Erie Division. A full-scale joint treatment plant should obtain a BOD removal of approximately 90 per cent in summer months and 80 - 85 per cent in winter months. Primary treatment should achieve a 25 per cent reduction in BOD and a 60 per cent reduction in suspended solids. Treatment of mixed wastes by the activated sludge process will require a long solids aeration period and a relatively low BOD to volatile solids loading to avoid high sludge volume indicies. The activated sludge process does not reduce the color of the mixed wastes and the final effluent will have about 40 mg/l of suspended solids. The chlorine demand of the final effluent averaged over 60 mg/l. A $NH_3$-$Cl_2$ mixture added at a level of 2.61 ppm $NH_3$ and 15-17 ppm $Cl_2$ showed promise as a disinfectant with coliform counts generally below 1,000/100 ml.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (a)(2), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 EGK

TITLE OF PROJECT: Biological Treatment of Chlorophenolic Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| City of Jacksonville,<br>Arkansas | George Putnicki<br>Region VI, EPA<br>1402 Elm Street<br>Dallas, Texas 75202 |

Project Site: Jacksonville, Arkansas

DESCRIPTION OF PROJECT

Award Date: July 1, 1968 Project Cost: $243,313

Completion Date: October 31, 1970 Federal Cost: $153,569

Summary:

In this project, installation of a completely stirred aeration lagoon between an existing conventional sewage treatment plant and existing stabilization ponds avoided hydraulic overloading of the former and reduced BOD loading of the latter. Joint treatment of domestic sewage and an industrial waste having high BOD and chlorophenols was facilitated. This study confirmed earlier findings that the organisms present in domestic sewage readily destroy complex chlorophenols and related materials. Glycolates and acetates contributing to the high BOD of the industrial waste were also readily oxidized biologically. High sodium chloride levels in the treated mixed waste did not adversely effect biological activity. Joint treatment of the complex chlorophenolic wastes combined with normal sewage gave rise to biological data which did not differ in any significant manner from that to be expected in a similar system receiving only normal sewage.

An historical background of the problem at Jacksonville, Arkansas; design and construction information, and the chemical and biological data resulting from the system study are presented in the final report.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 DJB

TITLE OF PROJECT: Controlled Treatment of Combined Potato Processing-Municipal Wastes by Anerobic Fermentation, Aerobic Stabilization Process

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| City of Grand Forks, North Dakota<br>P.O. Box 1518<br>Grand Forks, North Dakota | Christopher Timm<br>Region VIII, EPA<br>1860 Lincoln Street<br>Denver, Colorado 80203 |

Project Site: Grand Forks, North Dakota

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 17, 1968 | Project Cost: $796,904 |
| Completion Date: August 1, 1973 | Federal Cost: $389,478 |

Summary:

A full-scale, 4.5-mgd demonstration and evaluation of the joint treatment of municipal sewage in conjunction with potato processing wastes using several pretreatment methods prior to final treatment in existing stabilizations ponds will be undertaken in this project. The pretreatment methods include anerobic and aerated treatment (in series, anerobic treatment alone, and aeration alone) under varying seasonal waste load conditions.

In addition to determining the most efficient operation of the pretreatment methods, the effects of these methods on the conventional stabilization ponds will be extensively determined.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 DBF

TITLE OF PROJECT: Treatment of Combined Sewage and Neutral Sulfite Semichemical (NSSC) Pulp and Paper Mill Wastes by High-Rate Biological Filtration and Extended Aeration

GRANTEE OR CONTRACTOR:
Harriman Utility Board
P.O. Box 434
Harriman, Tennessee 37748

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Harriman, Tennessee

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | January 17, 1969 | Project Cost: | $322,540 |
| Completion Date: | January 16, 1972 | Federal Cost: | $238,905 |

Summary:

The objectives are to investigate the significant factors affecting the treatment of combined municipal sewage and NSSC pulp and paper mill wastes by high rate biological filtration and extended aeration, separately or in combination, and to establish design criteria, operating parameters, and treatment efficiencies.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (a)(2) , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 DPD

TITLE OF PROJECT: Combined Treatment of Municipal Kraft Linerboard and Fiberboard Manufacturing Wastes

GRANTEE OR CONTRACTOR:
The City of Macon
City Hall
Macon, Georgia 31201

EPA PROJECT OFFICER:
Edmond Lomasney
Region IV, EPA
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

Project Site: Macon, Georgia

DESCRIPTION OF PROJECT

Award Date: February 3, 1969

Completion Date: May 2, 1971

Project Cost: $171,845.00

Federal Cost: $128,883.75

Summary:

The successful treatment of domestic waste from one drainage basin of the City of Macon, Georgia, along with wastewater from an 850 ton-per-day Kraft linerboard mill and a 600 ton-per-day groundwood-cold caustic structural insulation board mill, was obtained in a 120 gallon-per-minute capacity plant. A pro-rated quantity of the total flow of each waste was treated.

The pilot plant consisted of combined and/or separate primary sedimentation units, followed by two parallel secondary treatment systems. Each secondary system received half of the plant influent. One secondary system consisted of 24-30 hours of extended aeration, while the other consisted of a high rate plastic media bio-filter followed by 12-15 hours of aeration. Both systems had secondary sedimentation and sludge return.

The secondary systems averaged approximately 92 per cent BOD removal with an effluent concentration in the range of 50 mg/l BOD. Auxiliary studies indicated that supplemental nutrients are not required. Chlorine proved to be the best disinfecting agent, but large amounts were required. An organism in the groundwood-cold caustic operation interfered with the fecal coliform test, making disinfection studies inconclusive. Settled secondary sludge was bulky, containing one to three per cent solids, and was difficult to dewater.

Estimated construction and operating costs for combined and separate treatment plants were prepared. The combined plant utilizing plastic media bio-filters along with 15-hour aeration is the most economical. In comparison, the combined system is more economical than separate facilities.

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 6 (a)(2), Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 12130 DUJ

TITLE OF PROJECT: Dynamic Process Development for Biological Treatment of Whey Bearing Wastes

GRANTEE OR CONTRACTOR:
Village of Walton
Village Hall
21 North Street
Walton, New York 13856

EPA PROJECT OFFICER:
Allyn Richardson
Region I, EPA
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Project Site: Walton, New York
Hastings on the Hudson, New York

DESCRIPTION OF PROJECT

Award Date: February 18, 1969 Project Cost: $80,047

Completion Date: August 18, 1970 Federal Cost: $52,730

Summary:

Efforts of this one-year bench and pilot study will be concentrated in resolving problems associated with biological treatment of wastes from the manufacture of cheese and associated dairy products. Frequency response techniques will be employed in the development of activated sludge systems with stable culture separation characteristics. Odor control techniques will be evaluated in packed tower trickling filter studies. A selected process will be employed in an on-site pilot plant.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2)*,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 DRT

TITLE OF PROJECT: Upstream Packing House Waste Treatment Demonstration,
City of Stockton

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| City Council<br>City of Stockton<br>Stockton, California | Harold G. Keeler<br>Industrial Pollution Control Branch<br>Water Quality Research, EPA<br>Washington, D.C. 20242 |

Project Site: Stockton, California

DESCRIPTION OF PROJECT

Award Date: February 25, 1969    Project Cost: $1,085,970

Completion Date: July 24, 1970    Federal Cost: $381,078

Summary:

A full-scale (2 mgd) development and demonstration of upstream treatment of packinghouse waste by use of aerobic treatment in a combination use of high rate activated sludge and in-sewer treatment will be undertaken in this project. The complex is anticipated to result in the reduction of BOD load to the municipal system of 80 per cent and demonstration of the utility value of the conveying sewer line to further treat sewage and to reduce capitol expenditures over a typical activated sludge plant otherwise required. It is intended to consider the use of the Kehr process for partial upstream treatment during pilot studies.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (a)(2), *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 DRO

TITLE OF PROJECT: Deepwater - Pilot-Plant - Engineering and Interception Feasibility Study

GRANTEE OR CONTRACTOR:
Delaware River Basin Commission
25 Scotch Road - P.O. Box 360
Trenton, New Jersey 08603

EPA PROJECT OFFICER:
Gilbert Horowitz
Region III, EPA
Curtis Building
Sixth and Walnut Streets
Philadelphia, Pennsylvania 19106

Project Site: Salem County, New Jersey

DESCRIPTION OF PROJECT

Award Date: April 1, 1969
Project Cost: $995,650

Completion Date: April 1, 1972
Federal Cost: $646,700

Summary:

A pilot-plant and engineering study to develop a chemical-biological treatment process for joint industrial-municipal wastes, capable of attaining at least 88 to 93 per cent removal of major pollutants will be completed in the project. Design, operating, and cost information is to be obtained for an 80-mgd regional treatment complex. The basic objectives of this project are:

1. Testing and evaluation of advanced waste treatment processes for final effluent polishing.
2. Development of suitable cost apportionment formulations for the treatment various industrial wastes by a joint regional complex operated by an interstate agency.
3. Development and demonstration of the requirements for organizing, operating, and administering a regional facility by an interstate agency.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section* 6 (a)(2) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 ENF

TITLE OF PROJECT: Vermont Cheese Industry Pollution Abatement

| | |
|---|---|
| GRANTEE OR CONTRACTOR:<br>Department of Administration<br>State of Vermont<br>Montpelier, Vermont 05602 | EPA PROJECT OFFICER:<br>Mr. Max Cochrane<br>NERC<br>200 S.W. 35th St.<br>Corvallis, Oregon 97330 |

Project Site: East Georgia and East Wallingford, Vermont

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | January 16, 1970 | Project Cost: | $2,040,900 |
| Completion Date: | January 16, 1973 | Federal Cost: | $832,120 |

Summary:

A three-year comprehensive program with an estimated total cost of $3,700,000 is planned for pollution abatement from the cheese industry, which contributes approximately 80 per cent of the industrial BOD load in the State of Vermont. The program will demonstrate the feasibility of economically eliminating 95 per cent of the total whey produced in the state by use of a central whey drying facility which will produce material suitable for human consumption. This facility, to be located in East Georgia, Vermont, will have a processing capacity of 375,000,000 pounds of fluid whey per year. A study of unit process operations of Chedder, Cottage, Bakers and Mozzarella plants will be conducted to increase solids recovery and minimize waste generation. Concentration and utilization of cottage cheese rinse waters is planned, as well as determination of most suitable forms of treatment for the residual wastes.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 FJQ

TITLE OF PROJECT: Pollution Abatement and By-Product Recovery in Shellfish and Fisheries Processing - Phase I

GRANTEE OR CONTRACTOR:
City of Kodiak
Box 685
Kodiak, Alaska 99615

EPA PROJECT OFFICER:
Kenneth Dostal
Pacific Northwest Water Laboratory, EPA
200 Southwest 35th Street
Corvallis, Oregon 97330

Project Site: Kodiak, Alaska

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: April 6, 1970 | Project Cost: $101,800 |
| Completion Date: June 6, 1971 | Federal Cost: $49,952 |

Summary:

This research and development project involves the evaluation of the various parameters involved in demonstrating the feasibility of constructing and operating a by-product recovery system for shellfish and fishery processing plants. Objectives include:

1. Conduction of an engineering survey of industrial waste quantities.
2. Conduction of pilot-plant experiments on by-product operations.
3. Preparation of a pre-construction summary report.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section* 6 (a)(2) *.*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 FAY

TITLE OF PROJECT: Aerobic-Anaerobic Pretreatment of Citrus Wastes

GRANTEE OR CONTRACTOR:
City Commission
City Hall
Brooksville, Florida 33512

EPA PROJECT OFFICER:
Dr. David Hill
Southeast Water Laboratory, EPA
College Station Road
Athens, Georgia 30601

Project Site: Brooksville, Florida

DESCRIPTION OF PROJECT

Award Date: June 30, 1970

Project Cost: $132,581

Completion Date: March 1, 1972

Federal Cost: $88,161

Summary:

During the grant period, the grantee will verify the design parameters for and determine the feasibility of operating an aerobic-anaerobic pretreatment system for a citrus fruit processing plant. The treatment facility will be located on city property and will be operated by the City of Brooksville. The pretreatment system consists of two aerobic basins with mechanical aerators and two anaerobic basins. These basins will be operated in sequences and combinations and under various biological conditions to determine the optimum system. The hydraulic capacity of the system is 144,000 gpd with effluent requirements of 250 mg/l BOD, 100 mg/l suspended solids, and pH of 6.5-8.5.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 HFK

TITLE OF PROJECT: Grease Removal and Pilot-Scale Biological Oxidation of Wool Scouring Wastewaters

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Division of Water Pollution Control<br>Commonwealth of Massachusetts<br>100 Cambridge Street<br>Boston, Massachusetts 02202 | Thomas Sargent<br>Southeast Water Laboratory, EPA<br>College Station Road<br>Athens, Georgia 30601 |

Project Site: South Barre, Massachusetts

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: June 30, 1971 | Project Cost: $162,000 |
| Completion Date: July 30, 1972 | Federal Cost: $98,482 |

Summary:

The State of Massachusetts will direct a project to demonstrate in pilot scale the feasibility of modifying a grease removal system and imploying an optimized extended aeration system for the removal of organic contaminants from wool-scouring wastewaters. The Barre Wool Combing Company in South Barre, Massachusetts, has a wool-scouring wastewater flow of 290,000 gallons per day which is very high in grease, suspended solids, and biochemical oxygen demand. The pilot-scale treatment system will be operated at a 1000-gpd rate for a 7-month period to allow for evaluation of the treatment processes through the winter months.

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6 (a)(2) ,
*Federal Water Pollution Control Act (PL 84-660), as* amended.

PROJECT NUMBER: 12130 GER

TITLE OF PROJECT: Optimization of Combined Industrial-Municipal Waste Treatment Through Automation and Reuse

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| The Miami Conservancy District<br>38 East Monument Avenue<br>Dayton, Ohio 45402 | James Phillips<br>Region V, EPA<br>1 North Wacker Drive<br>Chicago, Illinois 60606 |

Project Site: Franklin, Ohio

DESCRIPTION OF PROJECT

Award Date: October 1, 1971 Project Cost: $1,240,700

Completion Date: June 1, 1973 Federal Cost: $606,900

Summary:

The project plan is to construct and operate a regional type waste treatment facility which will serve all industrial and municipal users within the service area. The plant will result in the abandonment of the existing City of Franklin sewage treatment plant and four industrial treatment facilities, all of which are grossly inadequate. The project will stress high reliability and performance, flexibility, economy, recovery and recycle of pollutants and treated wastewater, and automation of waste treatment systems.

The project plant includes the evaluation and economic analysis of:

1. Separate industrial collection, primary treatment, and solids disposal facilities.
2. Recovery and reuse of industrial by-products.
3. Reuse of treated wastewater for industrial process.
4. Waste solids disposal by soil stabilization.
5. Secondary treatment of combined industrial waste by: (a) plug flow, hybrid flow, and completely mixed aerated stabilization, (b) activated sludge, and (c) contact stabilization.
6. Process control computer.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(b) *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801221

TITLE OF PROJECT: "Ecostatic Cane Processing System - Pilot Phase"

GRANTEE OR CONTRACTOR:
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96783

EPA PROJECT OFFICER:
Kenneth Dostal
EPA-NERC
200 S.W. 35th Street
Corvallis, Oregon 97330

Project Site: Pepeekeo, Hawaii

DESCRIPTION OF PROJECT

Award Date: April 1, 1972    Project Cost: $979,390

Completion Date: March 3, 1973    Federal Cost: $109,000

Summary:

The applicant proposes to pilot plant several system on a large scale which, if successful, would result in the processing of raw cane sugar with no discharge of liquid wastes to the environment and provide proper handling techniques for the various forms of solid waste. Systems to be evaluated include: a field harvester-cleaner, a dry cane cleaner, a juice wet cane cleaner (with juice added back to the process stream), a trash dry cleaner, a trash wet cleaner with silt removal and complete recycle of water on a stabilized slope disposal system for thickened muds.

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 12130 HRA

TITLE OF PROJECT: Tertiary Treatment of Municipal and Industrial Waste Waters with Recycled $MgCO_3$ and Lime

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Public Utilities<br>City of Gainsville<br>Gainsville, Florida 32601 | Edmond Lomasney<br>Region IV, EPA<br>1421 Peachtree Street, N.E.<br>Atlanta, Georgia 30309 |

Project Site: Gainsville, Florida

DESCRIPTION OF PROJECT

Award Date: July 1, 1971 Project Cost: $141,280

Completion Date: June 30, 1973 Federal Cost: $ 64,280

Summary:

During this 24 month project laboratory investigations will be initiated to develop the technology for using $MgCO_3$ and Lime in a tertiary clarification process for the treatment of selected industrial and municipal waste waters. The techniques for the recovery and reuse of $MgCO_3$ and Lime will be optimized for the waste waters under evaluation. Data obtained from the development activities will be utilized to design and operate a pilot scale system for the evaluation of the clarification process on municipal wastes.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 6(a)(2) ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: (12130 GCR) 800773

TITLE OF PROJECT: Development of Treatment and Control Technology for Refractory Petrochemical Wastes

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Department of Commerce & Industry<br>State of Louisiana<br>P.O. Box 44185<br>Baton Rouge, Louisiana 70804 | L. Frank Mayhue |

Project Site: New Orleans and Baton Rouge, Louisiana

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: February 2, 1972 | Project Cost: $827,587 |
| Completion Date: February 1975 | Federal Cost: $457,750 |

Summary:

The objectives of this research project are: (1) To develop and demonstrate waste treatment procedures for the reduction of refractory petrochemical wastes, equivalent to or exceeding that level of treatment attainable by biological treatment processes. Emphasis will be placed on the reduction of waste constituents affecting potable water supplies, aquatic and marine life with respect to tainting and odor. The process to be investigated (individually or in combination) will include biological oxidation, solvent extraction, adsorption, and ozone oxidation; (2) The development of an economical source of activated carbon from a waste petroleum based carbon by-product stream: and (3) A quantitative definition as to which refractory compounds pose as hazards in the lower Mississippi in current and projected concentrations, and the effect of industrial growth on steam quality.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# PPB 16130

# THERMAL POLLUTION

Of the four categories of water users in 1965, (1) Municipal (2) Industrial (3) Steam electric power, (4) Agriculture-livestock; the steam-electric power water user was second largest with 85,000 mgd usage. Only agriculture was a larger user. In 1980 steam - electric power will be the largest user (193,000 mgd vs 138,000 mgd for agriculture - livestock).

While a number of public utility power producing and industrial power producing plants make use of cooling towers in order to reduce the amount of heat rejected into bodies of water, the majority of the existing plants make use of once - through cooling water and have no provision for water reuse towers. While some existing power plants are adding cooling towers, ponds, and cannals, a large percentage of new plants are making provisions for water reuse as part of the original installation. Each power producing facility and its associated ecosystem must be evaluated on a case-by-case basis in order to determine whether such devices as cooling tower need be included.

The projects listed here cover technology areas suitable for once through, or reuse, of cooling waters in some way: they investigate the effects of waters plumes in bodies of water, they determine the amount of drift coming from cooling towers, they evaluate beneficial uses of heated water in agriculture etc. If all the remaining power plants expressed a willingness to install equipment to reduce or eliminate thermal discharges, the optimum technology for each facility would still have to be evaluated on an individual basis. The underlying motivation for the R&D portion of the thermal pollution program is therefore to develop technology which can be used in the overall determination of the best pollution abatement methods for any given facility or plant.

## PROJECT INDEX
## THERMAL POLLUTION

| PPB# | Grantee or Contractor | Project Status * | Page |
|---|---|---|---|
| 801433 | State of Maryland | E | 15-10 |
| 16130 HLX | Union Carbide | E | 15-11 |
| 16130 EIK | Eugene Water and Electric Board | C | 15-12 |
| 16130 HKK | Hittman Associates | E | 15-13 |
| 16130 GSD | Environmental System Laboratory | E | 15-14 |
| 16130 GNK | Environmental Systems Corporation | C | 15-15 |
| 16130 EMQ | Purdue Research Foundation | C | 15-16 |
| 16130 FSU<br>800435 | St. Anthony Falls Hydraulic Lab.<br>University of Minn. | C | 15-17 |
| 16130 FDQ<br>800613 | Vanderbilt University | C | 15-18 |
| 16130 FPE<br>801004 | Vanderbilt University | C | 15-19 |
| 16130 FLM | Washington State University | E | 15-20 |

* Project Status

A - Completed, Final Report Available
B - Final Report in Preparation
C - Work Continuing
D - Project Terminated
E - New Project

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FINAL REPORTS AVAILABLE

PPB 16130 - THERMAL POLLUTION

| Report Number | Title/Author | Source |
|---|---|---|
| 16130 --- 09/68 | Industrial Waste Guide on Thermal Pollution; by Pacific Northwest Water Lab., FWPCA, Corvallis, OR | NTIS - PB 197 262 |
| 16130 --- 12/68 | Experimental Study of Warm Water Flow Into Impoundments | |
| | Part I | NTIS - PB 188 512 |
| | Part II | NTIS - PB 188 513 |
| | Part III | NTIS - PB 188 514 |
| | by St. Anthony Falls Hydraulic Lab., Univ. of Minnesota | |
| 16130 DHS 07/69 | A Survey of Alternate Methods for Cooling Condenser Discharge Water--Large Scale Heat Rejection Equipment; by Dynatech R/D Co., Cambridge, Mass. | GPO - $1.25 |
| 16130 --- 09/69 | Working Paper No. 67: Economic Aspects of Thermal Pollution Control in the Electric Power Industry; by Alden G. Christianson and Bruce A. Tichenor, Pacific Northwest Water Lab., FWPCA, Corvallis, OR | ** |
| 16130 ENT 12/69 | Thermal Pollution: Status of the Art; by Vanderbilt Univ., Nashville, Tennessee | (Vanderbilt - $4.00) |
| 16130 EXT 12/69 | Mathematical Models for the Prediction of Thermal Energy Change in Impoundments; by Water Resources Engineers Inc., Walnut Creek, CA | GPO - $1.50 |
| 16130 --- 04/70 | Guidelines: Biological Surveys at Proposed Heat Discharge Sites; by Ronald R. Garton, Pacific Northwest Water Lab., FWQA, Corvallis, Oregon and Ralph D. Harkins, Robt. S. Kerr Water Research Center, FWQA, Ada, OK | GPO - $1.00 |

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## FINAL REPORTS AVAILABLE

## PPB 16130 - THERMAL POLLUTION

| Report Number | Title/Author | Source |
|---|---|---|
| 16130 DFX 05/70 | An Engineering-Economic Study of Cooling Pond Performance; by Littleton Research and Engr., Littleton, Mass. | GPO - $1.50 |
| 16130 DHS 08/70 | A Survey of Alternate Methods for Cooling Condenser Discharge Water--Operating Characteristics and Design Criteria; by Dynatech R/D Co., Cambridge, Mass. | GPO - $1.00 |
| 16130 FHJ 09/70 | Beneficial Uses of Waste Heat - An Evaluation; by Northwest Water Research Lab., FWQA, Corvallis, OR | NTIS - PB 201 724 |
| 16130 --- 10/70 | Thermoelectric Generators Powered by Thermal Waste From Electric Power Plants; by Mostafa A. Shirazi, Pacific Northwest Water Lab., FWQA, Corvallis, OR | GPO - $ .45 |
| 16130 DWO 10/70 | Mathematical Models for the Prediction of Temperature Distributions Resulting From the Discharge of Heated Water Into Large Bodies of Water; by Tetra Tech. Inc., Pasadena, CA | GPO - $1.75 |
| 16130 DHS 11/70 | A Survey of Alternate Methods for Cooling Condenser Discharge Water--Total Community Considerations in the Utilization of Rejected Heat; by Dynatech R/D Co., Cambridge, Mass. | GPO - $ .65 |
| 16130 EES 11/70 | Research on Dry-Type Cooling Towers for Thermal Electric Generation, Part I<br>Part II<br>by R. W. Beck & Associates, Denver, Colorado | GPO - $2.50<br>GPO - $1.00 |

FINAL REPORTS AVAILABLE

PPB 16130 - THERMAL POLLUTION

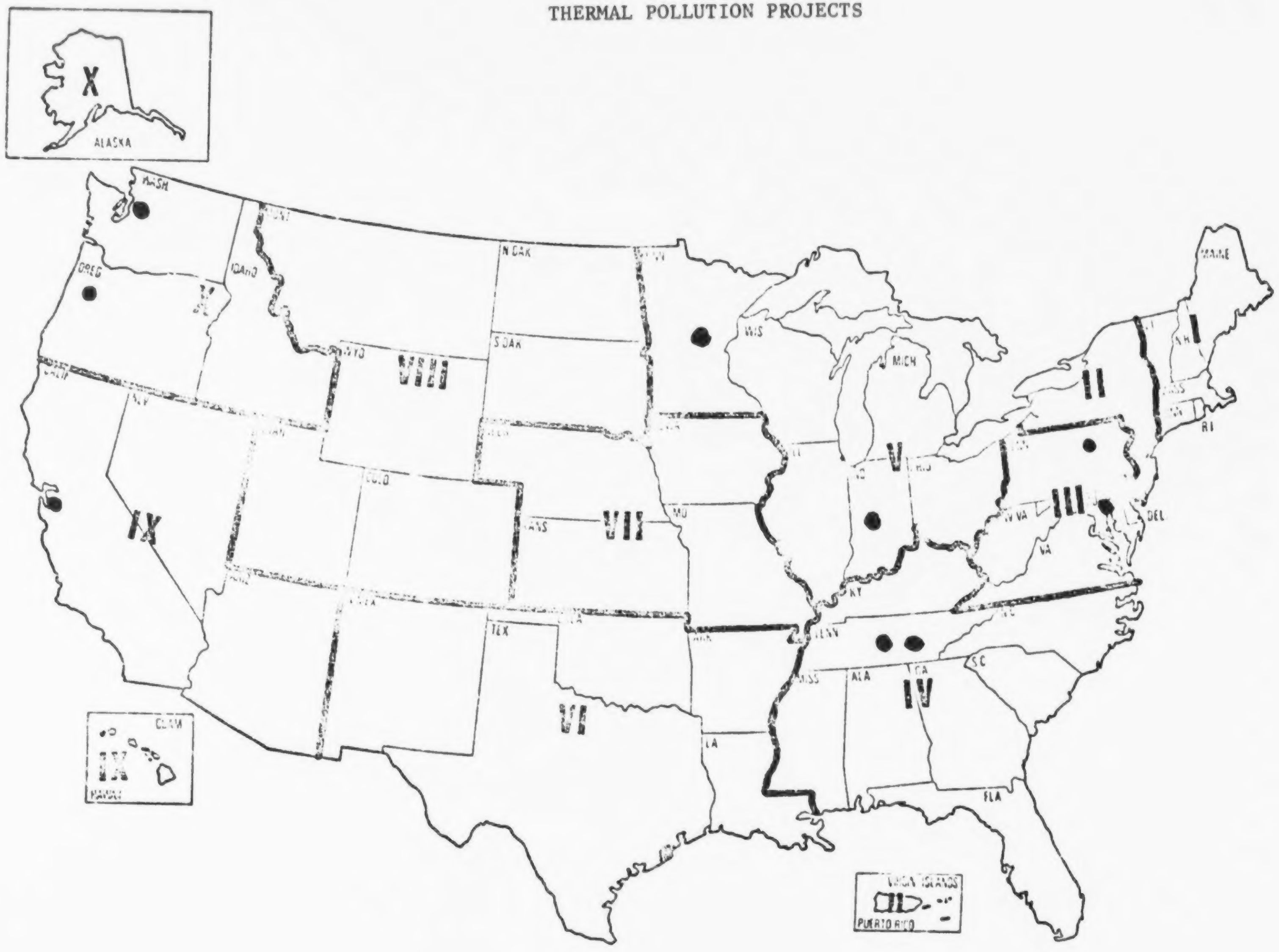
| Report Number | Title/Author | Source |
|---|---|---|
| 16130 GKF 12/70 | A Method for Predicting the Performance of Natural Draft Cooling Towers; by Pacific Northwest Water Lab., EPA, Corvallis, Oregon | GPO - $ .70 |
| 16130 DHS 01/71 | A Survey of Alternate Methods for Cooling Condenser Dicharge Water--System Selection; Design, and Optimization; by Dynatech R/D Co.,Cambridge, Mass. | GPO - $1.00 |
| 16130 DJH 01/71 | A Predictive Model for Thermal Stratification and Water Quality in Reservoirs; by Mass. Inst. of Technology, Cambridge, Mass. | GPO - $2.00 |
| 16130 DNH 01/71 | Potential Environmental Modifications Produced by Large Evaporative Cooling Towers; by E G & G, Inc., Boulder, Colorado | GPO - $ .75 |
| 16130 DPU 02/71 | Research on the Physical Aspects of Thermal Pollution; by Cornell Aeronautical Lab., Inc., Buffalo, NY | GPO - $1.75 |
| 16130 DJU 02/71 | An Analytical and Experimental Investigation of Surface Discharge of Heated Water; by Mass. Inst. of Technology, Cambridge, Mass. | GPO - $1.75 |
| 16130 FDQ 03/71 | Effect of Geographical Location on Cooling Pond Requirements and Performance; by Vanderbilt Univ., Nashville, Tennessee | GPO - $2.00 |
| 16130 FDQ 03/71 | Heated Surface Jet Discharged Into a Flowing Ambient Stream; by Louis H. Motz and Barry A. Benedict, Vanderbilt Univ., Nashville, Tennessee | GPO - $1.75 |

FINAL REPORTS AVAILABLE

PPB 16130 - THERMAL POLLUTION

| Report Number | Title/Author | Source |
|---|---|---|
| 16130 DNE 03/71 | Advanced Nonthermally Polluting Gas Turbines in Utility Applications; by United Aircraft Corp., East Hartford, Conn. | GPO - $2.00 |
| 16130 DJH 04/71 | Temperature Prediction in Stratified Water: Mathematical Model - User's Manual; by Ralph M. Parsons Lab., Mass. Inst. of Technology, Cambridge, Mass. | (At Press) |
| 16130 GFI 06/71 | Potential Environmental Effects of an Offshore Submerged Nuclear Power Plant, Vol. I<br>Vol. II<br>by General Dynamics, Electric Boat Div., Groton, Conn. | GPO - $2.50<br>GPO - $2.25 |
| 16130 GNK 10/71 | Development and Demonstration of Low-Level Drift Instrumentation; by Environmental Systems Corp., Knoxville, Tenn. | GPO $ .65 |
| 16130 FSU 12/71 | Surface Discharge of Heated Water; H. Stefan, N. Hayakawa and F. R. Schiebe, St. Anthony Falls Hydraulic Lab., Univ. of Minnesota, Minneapolis, Minn. | GPO - $2.00 |

# THERMAL POLLUTION PROJECTS



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# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 *,*
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 801433

TITLE OF PROJECT: "Power Plant Thermal Discharge Studies"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Power Plant Siting Program<br>State of Maryland | Frank Rainwater |

Project Site: Annapolis, Maryland

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: | Project Cost: $60,000 |
| Completion Date: | Federal Cost: $51,600 |

Summary:

A program is proposed to carry out a comprehensive review of the state-of-the-art of various control measures for power plant thermal discharges. Control techniques will be assessed by applying them to specific situations within the State of Maryland; however, the conclusions of the proposed study will be quite general and will be applicable elsewhere.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

CLEAN WATER

*This sheet describes briefly a grant under Section* 5 Res. Cont. , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 HLX

TITLE OF PROJECT: Heat Rejection From Power Generating Stations Enhanced Dry Cooling Tower System

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Union Carbide Corp.<br>Linde Div. | Mr. Frank Rainwater |

Project Site: Tonawanda, New York

DESCRIPTION OF PROJECT

| | | | |
|---|---|---|---|
| Award Date: | | Project Cost: | $62,000 |
| Completion Date: | 60 wks. ARO | Federal Cost: | $62,000 |

Summary:

In this proposal Union Carbide presents a method for improving the performance and reducing the cost of dry-cooling systems for electric power generation. Union Carbide proposes to design and to size condenser and cooling coil components based on a new concept and to prepare the data for input to the R.W. Beck dry-tower computer program for a total system evaluation.

Briefly, the new concept consists of inserting a closed-loop refrigerant fluid between the condensing steam and the air cooled condenser. As a result a more compact and highly effient system is expected.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Demonstration , *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 EIK

TITLE OF PROJECT: Thermal Water Demonstration Project

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Eugene Water & Electric Board<br>500 E. 4th Ave. P.O. Box 1112<br>Eugene, Oregon, 97401 | Frank Rainwater |

Project Site: Eugene, Oregon

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: May 1, 1972 | Project Cost: $160,580 |
| Completion Date: April 30, 1973 | Federal Cost: $ 99,900 |

Summary:

The objective of this project is to demonstrate beneficial uses to agriculture of water having sufficient heat to result in thermal pollution. The project will encompass the following areas: (1) Soil heating with thermal water, (2) Groundwater drain collection, (3) Water blending system, (4) Plant cooling, (5) Irrigation, (6) Environmental effects, and (7) Frost warning systems.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Contract ,
*Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 HKK

TITLE OF PROJECT: "Thermal Pollution Control System Nomographs"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Hittman Associates Inc. | Dr. B. Tichenor |

Project Site: Columbia, Maryland

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: 3-8-72 | Project Cost: $53,408 |
| Completion Date: 12-8-72 | Federal Cost: $43,408 |

Summary:

Develop sets of nomographs which shall be used to determine the costs and effectiveness of thermal pollution control alternatives. The nomograph shall be accompanied by descriptions of the processes covered, a description of the relationships used to prepare them, and illustrations of their use.

The best available data on performance and operating and capital cost shall be obtained from EPA, Water Pollution Control Research Series Report No. 16130 EES November 1970, Parts I and II (R.W. Beck and Associates).

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5 Contract *, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 GSD

TITLE OF PROJECT: Proposed Stochastic Calculation of Water Equilibrium Temperature

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Environmental Systems Lab | Mr. A. Joseph |

Project Site: Sunnyvale, California

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: Dec. 8, 1971 | Project Cost: $39,100 |
| Completion Date: July 8, 1972 | Federal Cost: $39,100 |

Summary:

1. Formulate a mathematical model for heat exchange at the surface of the earth.
2. Examine the sensitivity of this model with respect to meteorological data.
3. Calculate the probability distribution of the equilibrium temperature for at least 4 separate time windows.
4. Provide a software program for calculation of equilibrium temperature.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section* 5, *Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 GNK

TITLE OF PROJECT: "Explicit Calibration of the PILLS System"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Environmental Systems Corporation<br>Suite 101, Parkway Building<br>1212 Pierce Parkway<br>Knoxville, Tennessee | Frank Rainwater |

Project Site: Knoxville, Tennessee

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: March 16, 1972 | Project Cost: $11,400 |
| Completion Date: | Federal Cost: $10,800 |

Summary:

Environmental Systems Corporation proposes to refine, field test and demonstrate instrumentation for monitoring and measuring particle size distribution and density of water droplets in drift from cooling towers.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section 5, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 EMQ

TITLE OF PROJECT: Turbulent Bed Cooling Tower

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Purdue Research Foundation<br>Lafayette, Indiana | Dr. Shirazi |

Project Site: Lafayette, Indiana

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: 2-1-72 | Project Cost: $19,033 |
| Completion Date: 12-31-72 | Federal Cost: $18,081 |

Summary:

This is a continuation grant to complete the development of a turbulent bed cooling tower for cooling power-plant condenser cooling water.

The turbulent bed is a cylindrical bed of low density spheres fluidized by ambient air and sprayed from the top with hot water.

In this portion of the project the pressure drop and cooling data will be checked and correlated. The turbulent bed will be equipped with an overhead fan so that cooling performance can be measured.

All information will be combined into a design of the tower and an economic analysis will be performed to indicate optimum design.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

This sheet describes briefly a grant under Section 5,
Federal Water Pollution Control Act (PL 84-660), as amended.

PROJECT NUMBER: 16130 FSU

TITLE OF PROJECT: Mixing and Dispersion at a Warm Water Outlet

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| St. Anthony Falls Hydraulic Lab.<br>Mississippi River at 3rd Ave. S.E.<br>Minneapolis, Minnesota 55414 | Dr. Mostafa A. Shirazi |

Project Site: St. Anthony Falls Hydraulic Laboratory

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: 11/1/71 | Project Cost: $45,231 |
| Completion Date: 10/31/72 | Federal Cost: $43,066 |

Summary:

It is the objective of this research to continue an ongoing program to acquire information and develop methods for temperature and flow predictions in heated water effluents. In particular, efforts will be concentrated on solutions of the following problems.

a. To determine scale effects on flow and turbulent mixing in heated water surface plumes by acquisition of velocity and temperature data with laboratory results having identical densimetric outlet Froude numbers and downstream flow conditions.

b. To develop a temperature and velocity prediction method for heated water surface plumes which do not behave like buoyant surface jets.

c. To evaluate time-effects on dissipation of heat from thermal discharges. Temporary heat storage in natural bodies of water and resultant effects on "ambient" temperature surrounding plumes will be examined using one - and two-dimensional models.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

*This sheet describes briefly a grant under Section ___5___, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 800613 (16130 FDQ)

TITLE OF PROJECT: Project for Concentrated Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Vanderbilt University<br>Nashville, Tennessee 37203 | Frank Rainwater |

Project Site: Nashville, Tennessee

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: January 1, 1972 | Project Cost: $121,000 |
| Completion Date: December 31, 1972 | Federal Cost: $108,000 |

Summary:

The major research effort this year will be on the hydraulic and hydrologic aspects of thermal pollution control. The field data on the discharge of heated waters into rivers will be analyzed and a topical completion report issued. A topical report on the warming of cold, hypolimnetic water discharged to streams will be completed. Optimal hydraulic design of cooling ponds will be investigated. The critical analysis of computer codes for computation of temperature distributions in reservoirs will be finished. A common format will be developed and a topical report issued. The bulk movement of heat and pollutants vertically in a stratified reservoir will be investigated in the field to provide transport coefficients for the various theoretical models now in use. The effects of shape, spacing, roughness, etc., of the fill of cooling towers will be studied. An analysis of evaporation formulas will be carried out and mechanisms of unifying them into a consistent whole will be attempted.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

**ENVIRONMENTAL PROTECTION AGENCY**
**RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT**

CLEAN WATER

*This sheet describes briefly a grant under Section 5, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 FPE 801004

TITLE OF PROJECT: "Abstract Preparation for the Water Resources Scientific Information Center"

| | |
|---|---|
| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
| Vanderbilt University | Mr. Joseph I. Lewis |

Project Site: Nashville, Tenn.

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: 6-5-71 | Project Cost: $65,370 |
| Completion Date: 6-30-72 | Federal Cost: $35,354 |

Summary:

To serve the scientific and technical needs of scientists, engineers, and others interested in the field of Thermal Pollution with respect to available literature; (2) To establish Vanderbilt University as an information retrieval center for the area of Thermal Pollution; (3) To make this information available to the scientific community through the SELECTED WATER RESOURCES ABSTRACTS publication of the Water Resources Scientific Information Center, U.S. Department of the Interior; (4) To supply copies of requested abstracted articles at a nominal cost, when possible.

**ADDRESS INQUIRIES TO EPA PROJECT OFFICER**

# INFORMATION SHEET

CLEAN WATER

## ENVIRONMENTAL PROTECTION AGENCY
## RESEARCH, DEVELOPMENT OR DEMONSTRATION PROJECT

*This sheet describes briefly a grant under Section 5, Federal Water Pollution Control Act (PL 84-660), as amended.*

PROJECT NUMBER: 16130 FLM

TITLE OF PROJECT: "Analysis of Engineering Alternatives for Environmental Protection from Thermal Discharges"

| GRANTEE OR CONTRACTOR: | EPA PROJECT OFFICER: |
|---|---|
| Washington State University | Mr. Frank Rainwater |

Project Site: Seattle, Washington

DESCRIPTION OF PROJECT

| | |
|---|---|
| Award Date: July 1, 1971 | Project Cost: $33,582 |
| Completion Date: June 30, 1972 | Federal Cost: $30,041 |

Summary:

The objective of this project is to analyze and evaluate current and proposed engineering practices used in the protection of the water environment from the impact of thermal power systems.

ADDRESS INQUIRIES TO EPA PROJECT OFFICER

## ACKNOWLEDGEMENTS

The following people have contributed to the technical and administrative direction of the program.

William J. Lacy
Physical Science Administrator

B.S. in Chemistry from the University of Connecticut and completed course requirements for the PhD. Did post-graduate work at NYU Oak Ridge Institute of Nuclear Studies, Michigan. His technical papers and publications number over eighty. Serves on various committees of the AWWA, ACS, AIChE and WPCF. Listed in "Leaders of Science," "American Men of Science" and "Who's Who in the Southeast." Currently is Chief of Applied Science and Technology of EPA.

He has worked at the Engineer Research and Development Labs, Oak Ridge National Laboratory, Executive Office of the President, (OCD), and Office of the Secretary of the Army.

B.S. and M.S. in Chemical Engineering, University of Idaho and registered as a Professional Engineer in Maryland and Washington. As chief of the Heavy Industries Section of the Applied Science and Technology Branch, he is responsible for the technical and administrative direction of programs of that section.

Prior to joining the forerummer of EPA, the Federal Water Pollution Control Administration, he was a senior engineer with General Electric, where he did process and equipment development related to environmental pollution resulting from hazardous chemical and nuclear materials. He has authored numerous papers on waste management programs and technology.

George Rey
Supervisory Chemical Engineer

B.S. in C.E. from the University of Houston. As chief of the Food, Paper and other Industrial Sources Section, he is responsible for the technical and administrative direction of the program. His principal area of interest is wastewater treatment in the food processing industry.

Prior to entering research, he was in charge of facilities modification at NASA's Manned Space Flight Center. Before that he did design of storm structures for the Galveston District Office of the Corps of Engineers, and was a member of Brown & Root's design section. He is a member of the American Society of Civil Engineers and the Water Pollution Control Federation.

H. George Keeler
Supervisory Civil Engineer

Charles S. Ris
Staff Engineer

Holds a B.S. in Civil Engineering and a M.S. in Sanitary Engineering from Georgia Institute of Technology. Program management responsibilities include joint industrial-municipal, textiles, and rubber and plastics areas.

He is a registered Professional Engineer, with several years experience with the Georgia Water Quality Board and the U. S. Public Health Service.

Mrs. Scales is the Applied Science and Technology Branch Secretary. She handles the administrative and office management matters and serves as the general base for operating files and records as well as conference arrangements and meetings.

Her prior experience includes working for the Finance Department of the Data Processing Division of the District of Columbia.

Mable Scales
Branch Secretary

B.S., C.E., Worcester Polytechnic Institute; M.S., C.E., Northeastern University. Other post-graduate study at Oklahoma State University and the University of Michigan. Registered Professional Engineer in two States. A member of and served on, or serving on, various committees of the ASCE, American Concrete Institute, the American Welding Society, and the American Society for Engineering Education. Listed in "Who's Who in the Southeast." Currently involved with the planning and management of projects associated with stone, clay, glass and concrete industries and miscellaneous industrial sources.

Prior to joining EPA, he served as staff engineer, Office of the Secretary of the Army (OCD). Before entering Government service his professional work included extensive employment in industry, consulting in materials and structures, and teaching at the university level.

Arthur H. Mallon
Civil Engineer

Paul E. DesRosiers
Environmental Engineer

B.S. in Chemical Engineering and M.S. in Civil Engineering from the University of Massachusetts. Program management responsibilities for projects in the chemical and allied products, petroleum refining, and plastics and resin industries.

Prior experience includes supervisory and laboratory activities related to water and waste water treatment unit process/operations at the Army Mobility Equipment R&D Center, Fort Belvoir, Va.

Bachelor of Science, Master of Science and Doctor of Philosophy from the University of Oklahoma. His area of responsibility is planning and management for research and development projects for the pulp and paper, lumber, and other wood products industries.

James G. Gallup
Sanitary Engineer

Gilbert S. Jackson
Chemical Engineer

B.S. in Chemical Engineering, City College of New York; M.S. in Chemical Engineering and PhD., University of Maryland. Assists in the management of grants projects in the food processing industry.

Previous activities include service with the U.S. Naval Ordnance Laboratory and with Pratt & Whitney Aircraft Co. as an engineer investigating nonpolluting energy sources. He also taught at Montgomery College.

Bachelor of Science in Mechanical Engineering, University of Arizona. Registered Professional Engineer, Arizona. Principal effort is concern with grants projects associated with pollution resulting from power production, both thermal and nonthermal. Prior experience includes extensive employment in the private sector of industry as well as with NASA and the Corps of Engineers.

George Manning
Mechanical Engineer

Marshall Dick
Chemical Engineer

B.S., Chem. E., M.I.T.; M.S. in Organic Chemistry, Georgetown; M.S. in Operations Research, Johns Hopkins University and presently pursuing studies in environmental engineering there. Engaged in planning and management for pollution abatement projects related to textiles, rubber, plastic and metals.

Prior to joining EPA, his work included pollution abatement activities at the Naval Ship Research Center and research, development and design at Fort Detrick. In private industry he was with W.R. Grace and Pittsburg Plate Glass.

Mrs. Dunton serves as a secretary to the Heavy Industries Section. Her secretarial expertise is applied to all phases of the section's responsibilities. Work with the MTST machine is included with the many duties she performs.

Sharon Dunton
Secretary

Clara Williams
Secretary

Mrs. Williams serves as secretary for the Food and Paper Industries Section and is a part time student at George Washington University. Her proficiency extends to the MTST, the MCST, Data Fax 180, and various duplicating machines.

Prior positions were with the Office of Emergency Management, Office of Government Reports, War, Treasury, Commerce, and Defense Departments and the Veterans Administration.

Charlotte Cardwell, serves as a secretary in the Food, Paper and other Industrial Sources Section. Prior to joining the FPOIS, she was a secretary with the Agricultural and Marine Pollution Section for two years. She served in Fiscal Management for 18 months. Before that she was an Air Force cartographer, and served as a secretary for the Navy.

Charlotte Cardwell
Secretary

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